FENHEXAMID (215)

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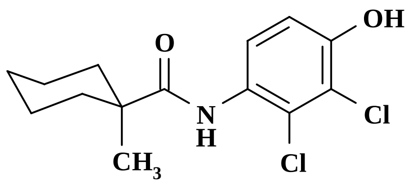
EXPLANATION

Fenhexamid is a hydroxyanilide protectant fungicide and has registered uses in a number of countries in a range of horticultural crops. It inhibits spore germ tube development and hyphal growth. It is a new pesticide in the Codex System. The CCPR, in 2002 (34^{th} Session), requested an evaluation by the present meeting of JMPR. The manufacturer submitted studies on metabolism, environmental fate, methods of residue analysis, freezer storage stability, national registered use patterns, supervised residue trials, fate of residues in processing, and national MRLs.

IDENTITY

Common name:	Fenhexamid
Chemical name:	
IUPAC:	2′,3′-dichloro-4′-hydroxy-1-methylcyclohexanecarboxanilide
CAS:	N-(2,3-dichloro-4-hydroxyphenyl)-1-methylcyclohexanecarboxamide
Manufacturer's code number:	KBR 2738
CAS number:	126833-17-8
CIPAC number:	603
Molecular formula:	$C_{14}H_{17}Cl_2NO_2$
Structural formula:	



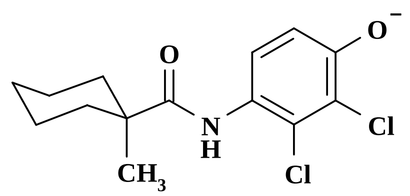
Molecular mass: 302.2 g/mol

Physical and chemical properties

A detailed chemical and physical characterisation of the active ingredient is given in Table 1.
References to test materials used:

1 KBR 2738 (batch 950821ELB04, purity 99.2 %)
2 KBR 2738 (batch 940111ELB01, purity 99.0 %)
3 KBR 2738 (batch 890306ELB01, purity 98.5 %)
4 KBR 2738 (FAS 101; Fl. 4258/76, purity 93.7 %)
5 KBR 2738 (batch 931216ELB01, purity 99.0 %)
6 [Phenyl-UL-^{14}C] KBR 2738,
radiochemical purity > 98 %, specific radioactivity 3.43 MBq/mg

Table 1. Physical and chemical data of fenhexamid.

Property	Results	Test material, method	Reference Report-No
Physical state, colour	Active substance, pure: white powder Active substance as manufactured: off-white powder	Material 1	Krohn, 1995 PC1062
Odour	Active substance, pure: no characteristic odour Active substance as manufactured: weak characteristic odour	Material 1, technical ai	Krohn, 1995 PC1062
Melting point	153 °C	Material 1, EU A.1.	Krohn, 1995 PC1062 Reubke, 1996 151552042
Relative density	1.34 g/mL at 20°C	Material 1, OECD 109 ≅ EU A.3.	Krohn, 1995 PC1063
Vapour pressure	$1.91 \cdot 10^{-6}$ to $2.58 \cdot 10^{-6}$ Pa at 30 °C $1.12 \cdot 10^{-5}$ to $1.38 \cdot 10^{-5}$ Pa at 40 °C $4.58 \cdot 10^{-5}$ to $5.28 \cdot 10^{-5}$ Pa at 50 °C $1.90 \cdot 10^{-4}$ to $2.01 \cdot 10^{-4}$ Pa at 60 °C $6.71 \cdot 10^{-4}$ to $8.66 \cdot 10^{-4}$ Pa at 70 °C Conclusion: $4 \cdot 10^{-7}$ Pa for 20 °C (extrapolated) $9 \cdot 10^{-7}$ Pa for 25 °C (extrapolated)	Material 2, OECD 104 ≅ EU A.4.	Krohn, 1995 PC1064
Volatility	Henry's law constant at 20 °C (calculated) pH 5: $9 \cdot 10^{-6}$ Pa · m^3 · mol^{-1} pH 7: $5 \cdot 10^{-6}$ Pa · m^3 · mol^{-1} pH 9: $3 \cdot 10^{-7}$ Pa · m^3 · mol^{-1}		Krohn, 1996 PC1438
Solubility in water including effect of pH	pH 5: 14 mg/L at 20°C pH 7: 24 mg/L at 20°C pH 9: 412 mg/L at 20°C	Material 1, OECD 105 ≅ EU A.6.	Krohn, 1996 PC1411
Solubility in organic solvents	n-hexane < 0.1 g/L at 20 °C toluene 5.7 g/L at 20 °C dichloromethane 31 g/L at 20 °C 2-propanol 91 g/L at 20 °C 1-octanol 65 g/L at 20 °C polyethylene glycol (PEG) 110 g/L at 20 °C PEG + ethanol > 200 g/L at 20 °C acetone 160 g/L at 20 °C acetonitrile 15 g/L at 20 °C dimethylformamide > 200 g/L at 20 °C dimethylsulfoxide > 200 g/L at 20 °C	Material 3, CIPAC MT 157, part 2	Krohn, 1993 PC1119
Dissociation constant	The substance shows weak acid properties in aqueous systems: pKa = 7.3 The reason for the weak acidic properties of the active substance is the phenolic OH-group of the molecule. Hence the dissociated species is the corresponding phenolate anion:  The pH value of a suspension of approximately 1g of the test substance in 50 mL of a 0.1 % sodium chloride solution is: pH = 5.94	Material 5, OECD 112 – spectrophoto-metric method	Stupp, 1995 PC939

Property	Results	Test material, method	Reference Report-No
Partition coefficient n-octanol/water	P_{ow} / log P_{ow} at 20 °C unbuffered 3300 3.52 pH 4 4200 3.62 pH 7 3200 3.51 pH 9 170 2.23	Material 1, OECD 107 ≅ EU A.8	Krohn, 1995 PC1096
Hydrolysis rate	Fenhexamid was found to be stable at pH 5, 7 and 9. Under the experimental conditions over a period of 30 days no formation of hydrolysis products was observed. Considering the hydrolytic stability determined under environmental pH and temperature conditions it is not expected that hydrolytic processes will contribute to the degradation of fenhexamid in the environment.	Material 6, EPA 161-1	Brumhard, 1995 PF4098
Photochemical degradation	Experimental photolytic half-life of fenhexamid in sterile aqueous buffered solution at 25 ± 1 °C: 1.0 h. More than 14 degradation products or metabolite fractions were observed. The main degradation product after 1 h was the benzoxazole of fenhexamid (M 10, WAK 7004) accounting for a maximum of 23.6 % of the applied radioactivity. During the continuous irradiation period of 15 days an amount equivalent to 39.3 % of the applied radioactivity was photo-mineralized to carbon dioxide (45d = 49.5 %). Recovery ranged from 90.2 to 109.4 % of the applied radioactivity.	Material 6, EPA 161-2	Brumhard and Bornatsch, 1995 PF4194

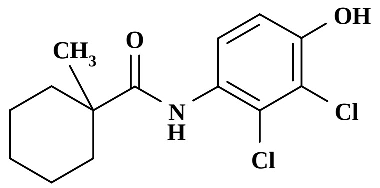
Formulations

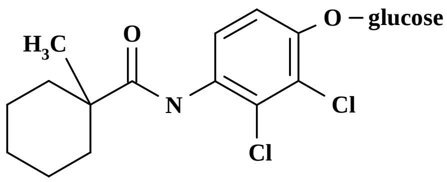
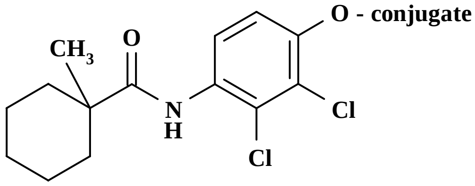
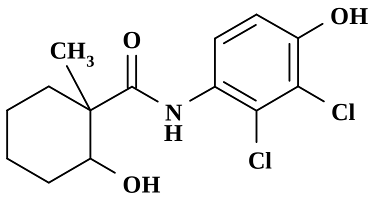
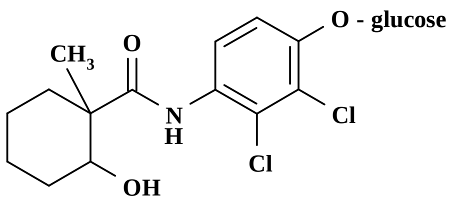
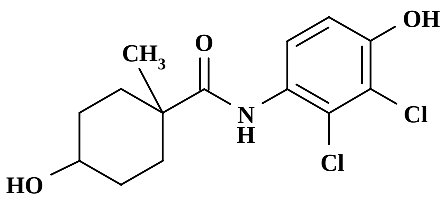
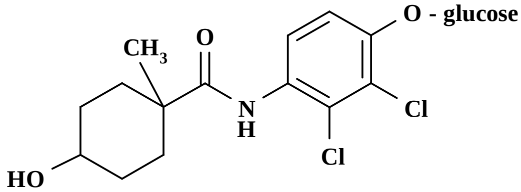
Formulation	Content of active ingredients
WG, WP, SC	fenhexamid 50 %
WG	fenhexamid 16.7 % & tolyfluanid 33.3 %
SC	fenhexamid 35 % & tebuconazole 6.67 %
SC	fenhexamid 30.5 % & tebuconazole 5.8 %
WP	fenhexamid 30 % & iminoctadine 20 %
WG	fenhexamid 25 % & procymidone 25 %
WG	fenhexamid 14.3 % & captan 53.6 %

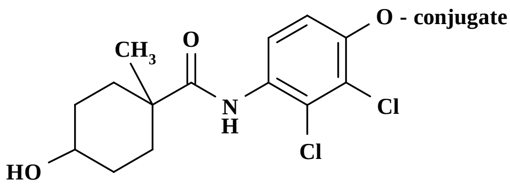
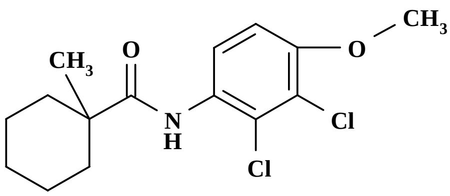
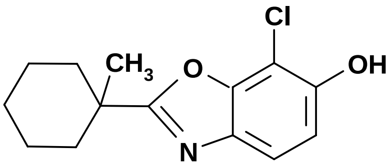
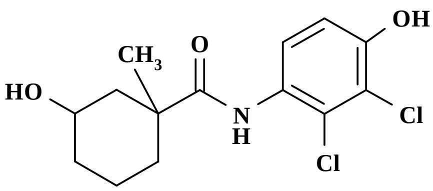
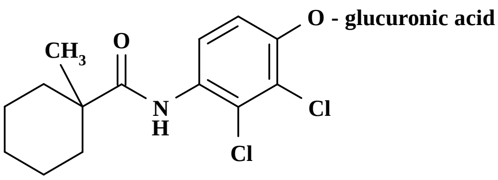
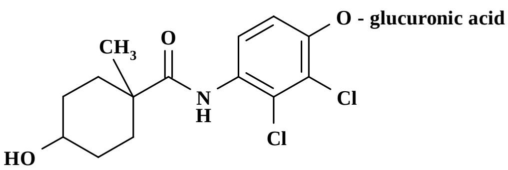
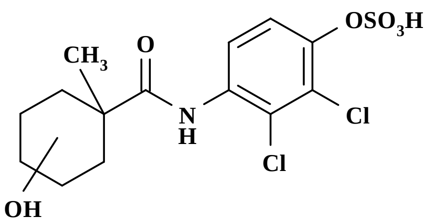
METABOLISM AND ENVIRONMENTAL FATE

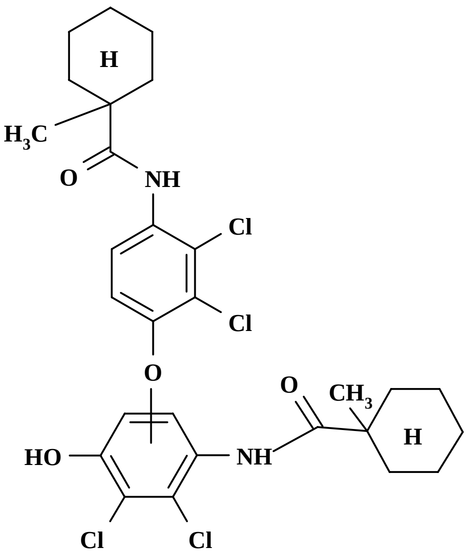
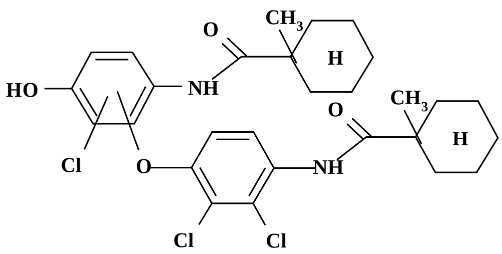
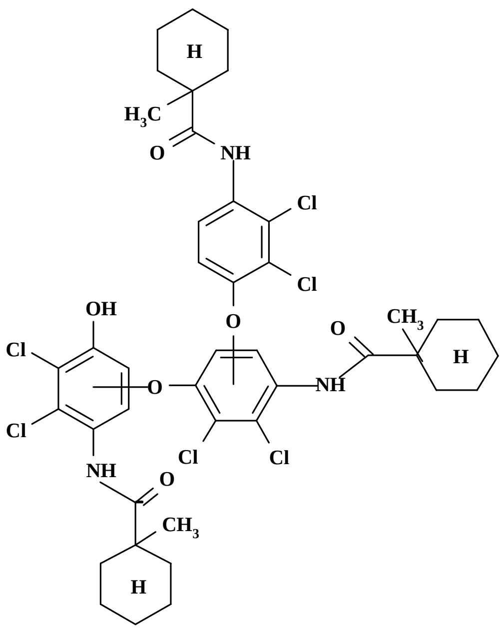
Chemical names, structures and code names of metabolites and degradation products of fenhexamid are shown in Table 2.

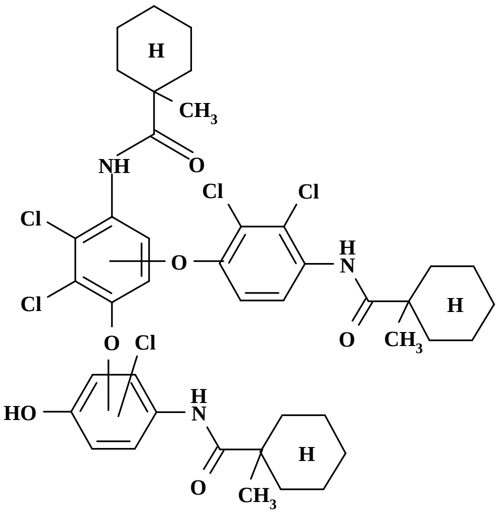
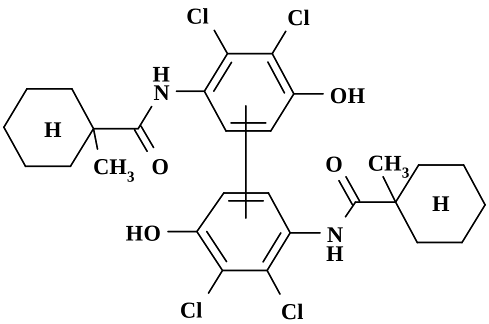
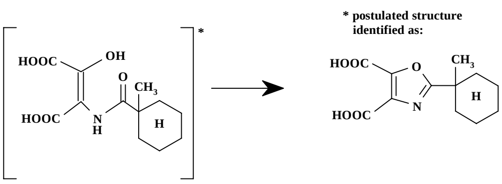
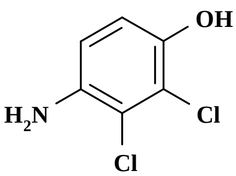
Table 2. List of metabolites – sorted by chemical structures.

Code	Structure	**Names, short forms and codes** (Name used in the evaluation written in bold letters)
ai		**fenhexamid** *CAS 126833-17-8* KBR 2738 N-(2,3-dichloro-4-hydroxyphenyl)-1-methyl-cyclo-hexanecarboxamide 2,3-dichloro-4-(1-methylcyclohexylcarbonyl-amino)-phenol BBJ 98-2

Code	Structure	Names, short forms and codes (Name used in the evaluation written in bold letters)
M01		**glucoside of fenhexamid**
M02		**conjugate of fenhexamid** malonyl glucoside of KBR 2738 KBR-glucoside-malonic-acid
M03		**2-hydroxy- fenhexamid** N-(2,3-dichloro-4-hydroxyphenyl)-2-hydroxy-1-methyl-cyclohexanecarboxamide 2-hydroxy-cyclohexyl-KBR 2738 2-hydroxy KBR 2-OH-KBR hydroxy-cyclohexyl derivative of ai ANC 0561L IS 1736A KBR 7133
M04		**glucoside of 2-hydroxy- fenhexamid** 2-OH-KBR-glucoside glucoside conjugate of 2-OH-KBR phenyl O-glucoside 2-hydroxy-KBR 2738
M05		**further conjugates of 2-hydroxy- fenhexamid**
M06		**4-hydroxy-fenhexamid** N-(2,3-dichloro-4-hydroxyphenyl)-4-hydroxy-1-methyl-cyclohexanecarboxamide N-(2,3-dichloro-4-hydroxyphenyl)-1-methyl-4-hydroxy-cyclohexancarboxamide 4-hydroxy-cyclohexyl-KBR 2738 4-hydroxy-KBR 4-OH-KBR 2738 hydroxy-cyclohexyl derivative of ai ANC 0549B KBR 6720 KBR 6798
M07		**glucoside of 4-hydroxy- fenhexamid** 4-OH-KBR-glucoside glucoside conjugate of 4-OH-KBR phenyl-O-glucoside of 4-hydroxy-KBR 2738 (axial and equatorial)

Code	Structure	Names, short forms and codes (Name used in the evaluation written in bold letters)
M08		**conjugate of 4-hydroxy-fenhexamid** phenyl-O-glycoside of 4-hydroxy-KBR 2738 (axial)
M09		**methyl ether of fenhexamid** N-(2,3-dichloro-4-methyloxyphenyl)-1-methylcyclohexanecarboxamide N-(2,3-dichloro-4-methyloxyphenyl)-1-methyl-cyclohexanecarboxamide BBJ 98-7 KBR 3596
M10		**benzoxazole of fenhexamid** 7-chloro-2-(1-methylcyclohexyl)-1,3-benzoxazol-6-ol WAK 7004
M16		**3-hydroxy-fenhexamid** N-(2,3-dichloro-4-hydroxyphenyl)-3-hydroxy-1-methyl-cyclohexanecarboxamide 3-hydroxy-cyclohexyl-KBR 2738 3-OH-KBR ANC 0561J KBR 7115
M17		**glucuronide of fenhexamid** KBR 2738 glucuronide KBR gluc. glucuronic acid conjugate of KBR 2738 ANC 0507D/G2 ANC 0549C
M18		**glucuronide of 4-hydroxy-fenhexamid** 4-OH KBR 2738 glucuronide 4-OH KBR gluc. glucuronic acid of 4-OH-KBR 2738 ANC 0549A Glucuronide of ANC 0549B
M19		**sulfate of isomeric hydroxy-fenhexamid**

Code	Structure	Names, short forms and codes (Name used in the evaluation written in bold letters)
M20		**[C-O-C] dimer of fenhexamid** [C-O-C]biphenyl BBJ 98-11
M21		**mono-deschlor [C-O-C] dimer of fenhexamid** deschlor [C-O-C]biphenyl BBJ 98-13
M22		**trimer of fenhexamid** trimer 2 BBJ 98-12

Code	Structure	**Names, short forms and codes** (Name used in the evaluation written in bold letters)
M23		**Mono-deschlor trimer of fenhexamid** trimer 1 BBJ 98-9
M24		**[C-C]biphenyl-fenhexamid** [C-C]biphenyl BBJ 98-8
M25		**maleic acid derivative of fenhexamid** 2-(1-methylcyclohexyl)-4,5-oxazoledicarboxylic acid BBJ 98-14
M34		**DCHA** *[CAS#: 39183-17-0]* 2,3-dichloro-4-hydroxyaniline 4-amino-2,3-dichloro-phenol BNF 5537C 930127ELB02

Animal metabolism

The metabolism of fenhexamid has been studied in laboratory rats and goats. The rat metabolism study (PF4149, Anderson and Bornatsch, 1996) was evaluated by the WHO Core Assessment Group of the 2005 JMPR. A short summary of the metabolism in rats, in comparison with that of goats, is given at the end of this section.

Lactating goat

The kinetic behaviour and metabolism of fenhexamid was investigated in the lactating goat (PF4387, Weber *et al.*, 1998). The test substance [phenyl-UL-^{14}C]fenhexamid was administered in a tragacanth suspension to one lactating goat at the oral target dose level of 10 mg/kg body weight (equivalent to 133 ppm in the feed) on three consecutive days with two time intervals of 24 hours between the single dosings. Sacrifice took place 6 hours after the final dose which was 54 hours after the first administration. Radioactivity was measured in the excreta, plasma and milk at different sampling intervals, and in the edible tissues kidney, liver, muscle and fat. The milk and edible tissues were analysed for parent compound and metabolites by extraction and chromatographic separation techniques (HPLC and TLC). The main radioactive compounds in extracts of tissues and milk were identified by chromatographic comparison with authentic reference compounds, by HPLC-MS/MS investigations or, in some cases, by NMR spectroscopic methods.

The goat was milked every morning prior to administration and every evening, 6 to 8 hours after the administration, and immediately before sacrifice.

Prior to sacrifice, excretion accounted for approximately 63.5% of the total radioactivity administered. The major excretory pathway of radioactive residues was via the faeces (38.6%), followed by urine (24.9%). A low amount (0.03% of the total dose) was secreted with the milk. At sacrifice the total radioactive residues in the edible tissues and organs were measured or estimated to be about 0.58% of the total dose.

At sacrifice, the highest equivalent concentration was measured in the liver (4.68 mg/kg wet tissue), followed by that obtained for the kidney (3.27 mg/kg). The concentrations corresponded to 0.47% (liver) and 0.038% (kidney) of the total dose. The concentrations in kidney and liver were followed in decreasing order by those obtained for the omental fat (0.126 mg/kg), perirenal fat (0.092 mg/kg), round muscle (0.039 mg/kg), subcutaneous fat (0.038 mg/kg), flank muscle (0.035 mg/kg) and loin muscle (0.032 mg/kg). Detailed results are given in Table 3.

Table 3. Residual radioactivity in edible tissues and organs of the lactating goat after repeated (3 ×) oral administration of 10 mg/kg at sacrifice 54 hours after the first administration (PF4387, Weber *et al.,* 1998).

Matrix	Fresh weight [g]	Equivalent concentration (TRR) [mg/kg]	% of the radioactivity totally administered
Liver	1221.8	4.682	0.470
Kidney	142.9	3.267	0.038
Round muscle (sample)	2692.9	0.039	-
Flank muscle (sample)	366.4	0.035	-
Loin muscle (sample)	160.5	0.032	-
Total body muscle [a)]	12000.0	0.035 [b)]	0.035
Perirenal fat (sample)	392.7	0.092	-
Subcutaneous fat (sample)	76.2	0.038	-
Omental fat (sample)	669.3	0.126	-
Dissectible total body fat [a)]	4800.0	0.085 [b)]	0.034
Calculated/estimated residue in the edible tissues/organs			0.577

[a)] calculated from the body weight (40 kg at sacrifice); assuming 30% and 12% of the body weight for total body muscle and dissectible total body fat, respectively

[b)] mean concentration of the three different types of muscle or fat

Equivalent concentrations of 0.212 mg/L and 0.182 mg/L were measured in the milk collected 8 hours after the first and second doses, respectively. The first value represented the highest concentration measured during the whole test period. The levels declined during the time period of 16 hours following the first and second dosings, to values of 0.048 mg/L and 0.045 mg/L, respectively. The concentrations in milk were comparable to those determined in the plasma at the same times. In terms of amounts, an extremely low fraction of 0.03% of the dose administered in total was found in the milk during the whole test period.

The predominant metabolite, in extracts from the milk sampled in the evening, was fenhexamid glucuronide (M17) accounting for about 71% of the TRR in the extracts or 0.134 mg/kg parent compound equivalents. In extracts from milk sampled in the morning, the predominant metabolite was fenhexamid glucuronide (M17) accounting for 59% of the TRR, i.e. 0.026 mg/kg parent compound equivalents.

The two predominant radiolabelled compounds in extracts of liver were fenhexamid and the equatorial (e) 4-hydroxy-fenhexamid (M06), accounting for 54 and 28% of the TRR, respectively. The corresponding equivalent concentrations were 2.53 and 1.32 mg/kg.

The major radioactive component in kidney extracts was the fenhexamid glucuronide (M17; 31% of the TRR) followed by 4-hydroxy-fenhexamid (e) (M06; 24% of the TRR), by fenhexamid (21% of the TRR) and by the axial (a) 4-hydroxy-fenhexamid glucuronide (M18; 9% of the TRR). The corresponding equivalent concentrations were 1.02 mg/kg, 0.78 mg/kg, 0.69 mg/kg and 0.31 mg/kg. For the identification of the latter compound LC-MS/MS and NMR spectroscopic methods were used.

HPLC analysis of extracts from composite samples of round, flank and loin muscle revealed three main radiolabelled components: fenhexamid glucuronide (M17), fenhexamid and 4-hydroxy-fenhexamid (e) (M06), which accounted for 24, 19 and 18% of the TRR in muscle, i.e. 0.009 mg/kg, 0.007 and 0.007 mg/kg.

HPLC investigations of the extract from composite samples of omental, subcutaneous and perirenal fat revealed three main radiolabelled compounds: fenhexamid accounting for 36%, 4-hydroxy- fenhexamid (e) (M06) accounting for 32% and fenhexamid glucuronide (M17) accounting for 9% of the TRR. The corresponding equivalent concentrations were 0.031, 0.027 and 0.008 mg/kg.

The quantitative distribution of fenhexamid and its metabolites is summarised in Table 4.

Table 4. Quantitative distribution of fenhexamid and its metabolites in extracts from the edible tissues and milk of the lactating goat, mean values of two extractions (PF4387, Weber *et al.*, 1998).

	Evening Milk		Morning Milk		Liver		Kidney		Muscle		Fat	
	% TRR	equiv. conc. [mg/kg]	% TRR	equiv. conc. [mg/kg]	% TRR	equiv. conc. [mg/kg]	% TRR	equiv. conc. [mg/kg]	% TRR	equiv. conc. [mg/kg]	% TRR	Equiv. Conc. [mg/kg]
TRR [a)]		0.189		0.044		4.682		3.267		0.035		0.085
ai	n.d.	n.d.	n.d.	n.d.	54.0	2.526	21.0	0.687	19.0	0.007	36.0	0.031
M06	n.d.	n.d.	n.d.	n.d.	28.1	1.316	24.0	0.784	18.1	0.007	31.5	0.027
M17	70.9	0.134	59.3	0.026	n.d.	n.d.	31.1	1.016	23.9	0.009	9.0	0.008
M18	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	9.4	0.308	n.d.	n.d.	n.d.	n.d.
Sum identified	70.9	0.134	59.3	0.026	82.1	3.842	85.5	2.795	61.0	0.023	76.5	0.066

% TRR — % of the TRR in the respective matrix, compare footnote [a)]
equiv. conc. — Equivalent concentration of fenhexamid and metabolites
n.d. — not detected
[a)] — TRR in organs/tissues after sacrifice

% TRR	% of the TRR in the respective matrix, compare footnote [a)]
M06	= equatorial 4-hydroxy-fenhexamid
M17	= glucuronide of fenhexamid
M18	= axial glucuronide of 4-hydroxy-fenhexamid

The unchanged parent compound was found in all tissue samples with the highest concentrations being detected in liver. The portion of parent compound in all tissues ranged from 19 to 54% of the TRR.

The metabolism of fenhexamid in the lactating goat proceeded via conjugation of the aromatic hydroxyl group and via hydroxylation of the cyclohexyl ring in the position 4. The resulting metabolites were the glucuronide of fenhexamid (M17), the equatorial 4-hydroxy-fenhexamid (M06) and the axial glucuronide of 4-hydroxy-fenhexamid (M18). Both glucuronides were readily excreted with the urine. The parent compound and the metabolites were stable during the whole study period.

The metabolism of fenhexamid in goat is comparable to metabolic routes already known from the rat. The proposed metabolic pathway is shown in Figure 1.

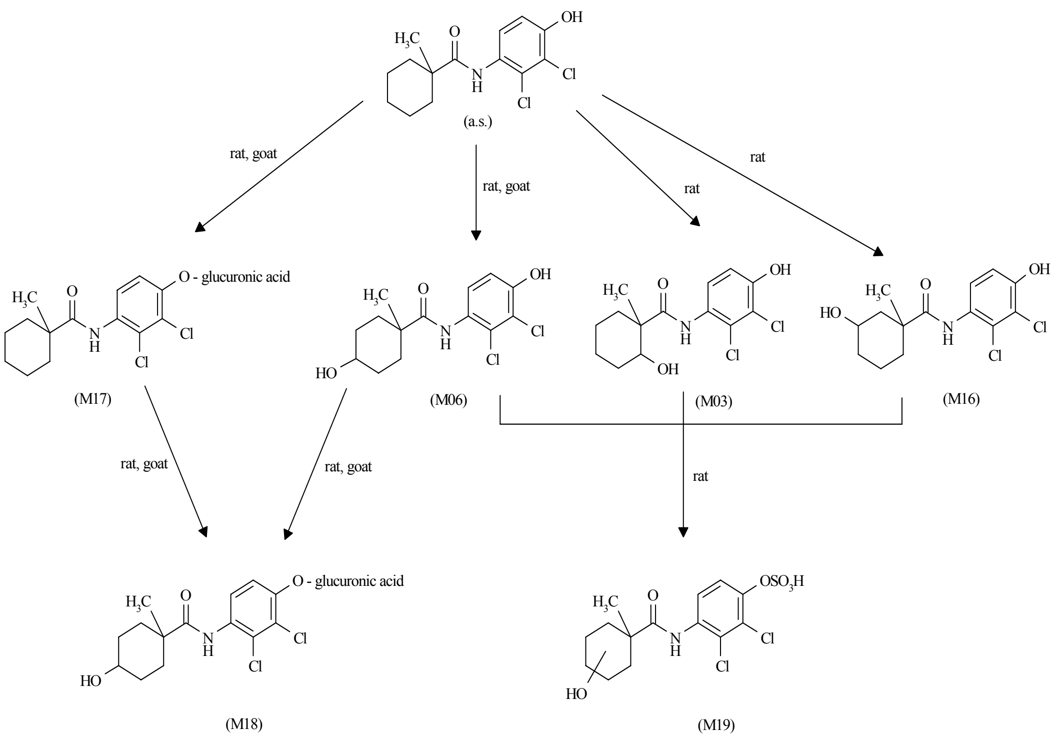


Figure 1. Proposed metabolic pathway of fenhexamid in goat and rat.

Plant metabolism

The behaviour and metabolism of [phenyl-UL-^{14}C]fenhexamid was investigated in grapes (PF4077, Clark *et al.* 1996), apples (PF4183, Reiner and Bornatsch, 1996), tomatoes (PF4163, Clark and Bornatsch, 1996), lettuce (MR-860/98, Reiner and Bornatsch, 1999), and field peas (MR-130/99, Reiner, 1999) under simulated field conditions using foliar spray applications. In all studies a 50 WP formulation of the fungicide was used. Additionally, separate translocation experiments were carried out for some of the above mentioned crops. The possible occurrence of the metabolite 2,3-dichloro-4-hydroxyaniline (DCHA = M34) was further investigated in a separate study (MR-92/97, Reiner and Clark, 1997).

Grapes

Grapes of the variety Müller-Thurgau were treated twice with [phenyl-UL-^{14}C]fenhexamid at an interval of 14 days (PF4077, Clark *et al.* 1996). The aqueous suspension (formulation: 50 WP) was applied with a micro-sprayer to individual grape bunches at an amount of 10.52 mg ai followed by 15.78 mg ai. Samples were taken at days 0 and 14 after the second application to determine the total radioactive residues (TRRs).

The TRR in grapes at day 0, including stalks and main stems, was determined by summation of the radioactivity in the surface wash solution, in the combined extracts and in the solids. The average TRR of the samples amounted to 5.88 mg/kg (expressed as parent compound equivalents), the majority being in the surface wash solution (about 93%).

At harvest (day 14), the grapes without stalks and main stems contained a TRR of 5.11 mg/kg (sum of the radioactivity in the combined extracts and in the solids). The distribution of the radioactivity between organic phase, aqueous phase and solids was 97.5%, 1.6% and 0.9%, respectively.

The results of the chromatographic analyses at day 14 are given in Table 5. About 97% of the radioactivity in grapes was either identified or characterised. The major radioactive component identified was unchanged parent compound, which amounted to approximately 88% (4.5 mg/kg). The major metabolites were the glucoside of fenhexamid (M01) with 2.7% (0.14 mg/kg) and the glucoside of 2-hydroxy-fenhexamid (M04) with 3.2% (0.17 mg/kg).

Two separate translocation experiments were conducted in the same study. [Phenyl-UL-^{14}C]-fenhexamid was applied twice to leaves immediately above and below the target bunch of grapes. At the end of the experiment 54 - 60% of the radioactivity was recovered from the treated leaves. Approximately 0.01% was found in the grapes. This indicated that practically no radioactivity had translocated from the leaves into the grapes.

Apples

Apples, grown in a controlled vegetation area, were treated twice at an interval of 14 days with [phenyl-UL-^{14}C]- labelled fenhexamid (formulated as 50% wettable powder, 50 WP) using a syringe fitted with a brush tip (PF4183, Reiner and Bornatsch, 1996). The applied rate was equivalent to 2 x 0.13 mg of active substance per apple, based on a proposed field rate of 4 x 0.75 kg/ha of fenhexamid (the two applications during flowering were omitted; the total amount used was equivalent to four applications). The apples were sampled immediately after the second application (day 0) and at day 7.

The TRR in apples amounted to 2.1 mg/kg and 1.34 mg/kg parent compound equivalents at day 0 and day 7, respectively. The distribution of ^{14}C residues after the extraction of the apples was 96.8% (day 0) and 94% (day 7) in the wash solution, 2.2% and 3.3% in the dichloromethane phase, 0.8% and 1.9% in the aqueous phase. Only 0.2% (day 0) and 0.8% (day 7) remained in the solids (non-extractable residue). Fenhexamid and identified metabolites accounted for 90.3% of the total radioactive residue at day 0 and 92.3% at day 7. Unchanged active substance and metabolites were identified as detailed in Table 5.

The majority of TRR was detected as unchanged parent compound, which amounted to 89.0% at day 0 and 89.4% at day 7. The main metabolites were 2-hydroxy-fenhexamid (M03) and 4-hydroxy-fenhexamid (M06) with 0.6% and 0.4% (day 0) and 1.1% and 0.8% (day 7), respectively. The corresponding glycosides M04 and M07 amounted to 0.1% and 0.2% (day 0) and 0.4% and 0.5% (day 7), respectively. The identification was conducted with extracts of an approximately 5× overdose experiment. At least nine unknown components, none of which exceeded 2.5% (day 0) or 1.6% (day

7) of the TRR were detected in the surface wash solutions, dichloromethane phases and aqueous phases (total unknown metabolites: 9.5% (day 0) and 6.9% (day 7), respectively).

A translocation experiment was conducted, in which [phenyl-UL-^{14}C]fenhexamid was applied twice to leaves above and below target apples. Seven days afterwards samples were taken. Only traces of parent compound and metabolites (0.04%) were translocated from the leaves to the target apples.

Tomatoes

In a greenhouse study (PF4163, Clark and Bornatsch, 1996), [phenyl-UL-^{14}C]fenhexamid was applied three times to tomatoes at intervals of 10 and 11 days, using a pipette fitted with a brush tip. The application solutions were prepared by the addition of water to the 50 WP formulation. The application rate of the active substance amounted to 3.6 mg, 3.33 mg and 3.89 mg (per 50 tomatoes), which corresponded to 3 × 1.3 kg ai/ha. The tomatoes were harvested at maturity, ten days after the last application.

The TRR in tomatoes, calculated in active substance equivalent, was 1.67 mg/kg. This is the sum of the radioactivity in the surface wash solution, in the aqueous phase, n-hexane phase and the solids after extraction of the homogenised tomatoes. The majority of the TRR was recovered in the surface wash solution (89.3%), 8.9% was detected in the aqueous phase, 1.3% in the n-hexane phase and only 0.5% remained unextracted in the solids. The solids and n-hexane phase were not further investigated.

The radioactivity present in the surface wash solution consisted of parent compound only. Seven metabolites were identified in the aqueous phase from a total of 12, and these seven accounted for 6.6% of the TRR present in this phase. Of the 6.6%, 4.2% was based on 4-hydroxy-fenhexamid either in the free form (M06) or conjugated (M07 and/or M08). Two further metabolites, conjugates of the parent compound (M01 and/or M02), accounted for 1.6% of the TRR. In total, 95.9% of the TRR in tomatoes was identified. For details see Table 5.

Two separate translocation experiments on tomatoes were carried out in the same study. Leaves immediately above and below the target bunch of tomatoes were treated three times. After ten days the samples were taken. The results showed that most of the applied radioactivity was found in the treated leaves (64 and 67%) and only very small amounts were detected in the fruits (0.03 and 0.01%). The rest of applied radioactivity was lost, probably due to volatilisation.

Lettuce

Lettuce plants were treated twice with [phenyl-UL-^{14}C]fenhexamid (formulated as WP 50) in a greenhouse study (MR-860/98, Reiner and Bornatsch, 1999). Tow applications were made using a computer controlled track sprayer with a flat fan nozzle corresponding to a field application rate of 0.843 kg ai/ha. The first application was conducted approximately 5 weeks before harvest, followed by a second application approximately 4 weeks later (day 0), 7 days before harvest. A total of ca. 92.8 mg ai (2 x 46.4 mg ai) was applied to the test area (approximately 0.55 m^2, ten plants) corresponding to a field application rate of approximately 1.7 kg ai/ha.

The total radioactive residue (TRR) in lettuce (day 7) amounted to 19.83 mg/kg parent compound equivalents as determined by summation of the radioactivity in the combined methanol/water extracts and the solids. The majority (98.1% of TRR) was readily extracted by homogenisation with methanol and methanol/water. Following extraction, 92.2% (18.28 mg ai equiv./kg) partitioned into the dichloromethane phase, 5.9% (1.16 mg ai equiv./kg) remained in the aqueous phase, and 1.9% (0.39 mg ai equiv./kg) was not extracted.

The results of the chromatographic analyses at day 7 are given in Table 5. In total, 93.6% of the TRR in lettuce was identified, and further 4.5% was characterised.

The major radioactive component identified was unchanged parent compound, which amounted to approximately 91% (18 mg/kg). The main metabolites were the glucoside of fenhexamid (M01) with 0.3% (0.06 mg ai equiv./kg) and the malonyl glucoside of fenhexamid (M02) with 2.6% of TRR (0.51 mg ai equiv./kg). At least 9 metabolites were characterised, not exceeding 1.9% of TRR, each. It was shown by TLC analysis with a solvent system which is especially suitable for the investigation of 2,3-dichloro-4-hydroxyaniline (DCHA = M34) that DCHA was not a metabolite in lettuce.

Table 5. Distribution of active substance and metabolites (% of recovered radioactivity) in different crops and crop parts after spray application of [phenyl-UL-^{14}C]fenhexamid.

Crop	grapes	apples		tomatoes	lettuce
Crop part	fruit without stem and stalk	fruit		fruit	plant
Application rate (kg ai/ha)	1 x 0.375 + 1 x 0.56	equivalent to 4 x 0.75		3 x 1.3	2 x 0.843
Days after application	14	0	7	10	7
TRR = mg/kg	5.11	2.10	1.34	1.67	19.83
Fenhexamid (KBR 2738)	87.9	89.0	89.4	89.3	90.7
M01	2.7	< 0.1	0.1	0.2	0.3
M02	0.2	-	-	1.4 4)	2.6 4)
M03	0.4	0.6	1.1	0.4	-
M04	3.2	0.1	0.4	0.4	-
M06	0.5	0.4	0.8	1.8	-
M07	-	0.2	0.5	1.0	-
M08	-	-	-	1.4	-
M08 + 1)	0.5	-	-	-	-
1)	0.5	-	-	-	-
2)	1.3	-	-	-	-
Remained 3)	-	-	-	1.3	-
Unknown (%)	1.9	9.5	6.9	2.3	4.5
Not extract. (%)	0.9	0.2	0.8	0.5	1.9
Total (%)	100	100	100	100	100

M01 = glucoside of KBR 2738
M02 = conjugate of KBR 2738
M03 = 2-hydroxy-KBR 2738
M04 = glucoside of 2-hydroxy-KBR 2738
M06 = 4-hydroxy-KBR 2738
M07 = glucoside of 4-hydroxy-KBR 2738
M08 = conjugate of 4-hydroxy-KBR 2738

1) = other hydroxy-KBR 2738 metabolites
2) = apolar and probably unconjugated metabolite
3) = fractions not further analysed due to low amounts of radioactivity
4) = malonyl glucoside of KBR 2738

Field peas

In a greenhouse study [phenyl-UL-^{14}C]fenhexamid (formulated as WP 50 / ingredients of a WG 50) was applied twice to field peas simulating practical spray application conditions (MR130/99, Reiner, 1999). The first application was conducted at the beginning of flowering (growth stage 61 – BBCH Scale) and the second application (day 0) when full flowering (growth stage 65) was reached according to the projected treatments in practice. The field peas were grown in a 1 m^2 planting container. A computer controlled track sprayer with a flat fan nozzle was used for spraying. The total application rate of the active substance amounted to 168.6 mg, which corresponded to a seasonal field rate of approximately 1.7 kg ai/ha. The field peas were harvested in four fractions and analysed in the metabolism study: hay (day 9), vines (day 21), pods incl. seeds (day 21), and dry seeds (day 77).

The TRR in separate field pea fractions was determined by summation of the radioactivity of the combined methanol/water extracts and in the solids after this solvent extraction, calculated in active substance equivalents. The TRR in the hay fraction of field peas was 24.02 mg ai equiv./kg, the

TRR in vines was 14.32 mg ai equiv./kg and in pods was 0.23 mg ai equiv./kg. Finally, the TRR of dry seeds amounted to 0.20 mg ai equiv./kg.

The majority (93.5%) of the TRR in field pea hay (day 9) was readily extracted by homogenisation with methanol and methanol/water. Following extraction, 88.0% partitioned into the dichloromethane phase 1 and 5.4% remained in the aqueous phase 1. The solids of the first extraction step (6.5%) were exhaustively extracted with dioxane/2N HCl. A smaller amount of 1.0% partitioned from the extract into the dichloromethane phase 2 and 3.6% remained in the aqueous phase 2. A total of 2.0% (0.49 mg ai equiv./kg) remained unextracted (solids).

The distribution of TRR in vines and pods was similar to those in hay. In vines, a total of 1.5% (0.22 mg ai equiv./kg) was unextracted. In pods, the radioactivity in the final solids amounted to 3.5% (≤ 0.01 mg ai equiv./kg).

The distribution of TRR in dry seeds differed from those of the other fractions. Only a relatively low portion of the radioactivity (31% of the TRR) was extracted by homogenisation with methanol/water. Following extraction, 17% (0.03 mg ai equiv./kg) partitioned into the dichloromethane phase 1, and 14% (0.03 mg ai equiv./kg) remained in the aqueous phase 1. The solids from the first extraction step were not only hydrolysed with dioxane/HCl but the resulting solids were additionally extracted with 1N KOH. From the hydrolysis extract, 14.2% (0.03 mg ai equiv./kg) partitioned into the dichloromethane phase 2, and the main portion of 28% (0.06 mg ai equiv./kg) remained in the aqueous phase 2. After hydrolysis, a relatively high amount of the TRR was still unextracted. The subsequent KOH extract (17.2%) was not further investigated. A total of 9.6% (0.02 mg ai equiv./kg) remained unextracted in the solids of dry seeds after both exhaustive extraction steps.

The major amount of the TRR of hay, vines, and pods was readily extracted using methanol/water and was mainly due to unchanged parent compound accounting for approximately 80% of the TRR. Further portions of 0.4% of the parent compound were identified in hay and vines after exhaustive extraction using dioxane / 2N HCl. The aqueous phases 1 (obtained after extraction with methanol/water) were further characterised by total hydrolysis using acidic (1N HCl) and enzymatic (β-glucosidase, cellulase) methods, followed by partition of the hydrolysis products (aglycones) with ethyl acetate and TLC analysis. This procedure allowed the identification of further amounts of parent compound (1.0 to 3.7%), as well as of low amounts of the two metabolites 2-hydroxy-fenhexamid (M03) and 4-hydroxy-fenhexamid (M06) obtained after hydrolysis of the respective conjugates. A couple of further unknown components were detected in low amounts and characterised by TLC. Unconjugated hydroxylated derivatives of the parent compound were not identified in field peas. The total amount of fenhexamid obtained from all extracts and the quantitation of identified aglycones are given in Table 6.

In dry seeds only the parent compound was identified. However, the extraction of radioactive residues was more difficult and two exhaustive extraction steps were needed after methanol/water extraction (dioxane / 2N HCl followed by 1N KOH).

Table 6. Distribution of active substance and metabolites (% of recovered radioactivity) in field peas after spray application of [phenyl-UL-^{14}C]fenhexamid (MR130/99, Reiner, 1999).

Crop part	hay	vines	pods	dry seeds
Application rate (kg ai/ha)	2 x 0.843			
Days after application	9	21	21	77
TRR = mg/kg	24.02	14.32	0.23	0.20
ai [4)]	87.1	86.4	81.2	20.9
M01	-	-	-	-
M02	-	-	-	-
M03 [5)]	0.3	0.4	n.d.	n.d.

Crop part	hay	vines	pods	dry seeds
Application rate (kg ai/ha)	2 x 0.843			
Days after application	9	21	21	77
M04	-	-	-	-
M06 6)	0.3	0.3	0.4	n.d.
M07	-	-	-	-
M08	-	-	-	-
M08 + 1)	-	-	-	-
1)	-	-	-	-
2)	-	-	-	-
Remained 3)	10.4	11.5	15.0	69.4
Unknown (%)	-	-	-	-
Not extractable (%) 7)	2.0	1.5	3.52	9.6
Total (%)	100	100	100	100

ai Fenhexamid (KBR 2738)
M01 = glucoside of KBR 2738
M02 = conjugate of KBR 2738
M03 = 2-hydroxy-KBR 2738
M04 = glucoside of 2-hydroxy-KBR 2738
M06 = 4-hydroxy-KBR 2738
M07 = glucoside of 4-hydroxy-KBR 2738
M08 = conjugate of 4-hydroxy-KBR 2738
1) = other hydroxy-KBR 2738 metabolites
2) = apolar and probably unconjugated metabolite
3) = fractions not further analysed due to low amounts of radioactivity
4) = sum of all extracts
5) = aglycone of the glucoside of 2-hydroxy-KBR 2738 after enzymatic hydrolysis
6) = aglycone of the glucoside of 4-hydroxy-KBR 2738 after enzymatic hydrolysis
7) = unextracted solids after exhaustive extraction
n.d. not detected

Investigation on the possible metabolite DCHA (M34) in plants

Samples from the three plant metabolism studies in grapes (PF4077, Clark *et al.* 1996), apples (PF4183, Reiner and Bornatsch, 1996), and tomatoes (PF4163, Clark and Bornatsch, 1996) were further investigated for the presence of 2,3-dichloro-4-hydroxyaniline (DCHA=M34) as a possible degradation product following hydrolysis of fenhexamid in plants (MR-92/97, Reiner and Clark, 1997).

The majority of the extraction procedures and of the data in this study were already reported in the above cited studies on the metabolism of fenhexamid in grapes, apples and tomatoes. Additionally, two hydrolysis experiments were conducted to confirm the hydrolytic stability of fenhexamid. Various soluble fractions were analysed for 2,3-dichloro-4-hydroxyaniline (DCHA) by TLC and HPLC.

Surface wash solution, organic phase or aqueous phase of apples were analysed for DCHA by TLC with a very unpolar solvent system (dichloromethan:metanol, 99:1), well suited for chromatographic separation of DCHA from parent compound. Neither of the extracts contained DCHA. Additionally, the aqueous phase was treated enzymatically (β-glucosidase, cellulase) and with acidic hydrolysis. None of the treatments produced DCHA. The hydrolysis products detected were all derived from conjugates or cyclohexyl-hydroxylated derivatives of the parent compound. Examination of the detectable limits indicated that DCHA was not a metabolite in apples.

Similar investigations were conducted with extracts of grapes. The HPLC chromatogram of organic phase 1 showed that no DCHA was present. In the aqueous phase 1, the possible presence of trace amounts of DCHA was indicated by HPLC chromatography. However, the identity of this metabolite as DCHA was by no means definitively confirmed. But assuming this metabolite was DCHA then the total maximum amount of the TRR in grapes that could be possibly attributed to DCHA was only 0.12% (0.006 mg/kg).

Solutions of the tomato study were reanalysed by HPLC for the presence of DCHA. Metabolites in the aqueous phase were totally cleavable with enzymes to hydroxy compounds of the parent compound, thus showing that they were not DCHA. Clearly showing that no DCHA was present treated in tomatoes.

For the hydrolysis experiments aliquots of [phenyl-^{14}C]fenhexamid were evaporated to dryness and than heated under reflux with HCl and NaOH (both 1 mol/L), respectively. After cooling, the solutions were neutralised, resolved in methanol and analysed by TLC and HPLC for DCHA. The HPLC investigation showed no DCHA in the solutions, but the TLC investigation indicated trace amounts (1.2% with NaOH, 2.2% with HCl). From the results of the hydrolysis experiments and the metabolism reports it was concluded that the amide group of fenhexamid was stable.

Extracted radioactivity and distribution into various fractions in apples, grapes and tomatoes was very similar. The vast majority of radioactivity was unchanged parent compound. No DCHA was detected in these plant metabolism studies, although from theoretical calculations trace amounts could have been present.

Environmental fate

Because fenhexamid is used for foliar spray treatment, from the environmental fate submission only studies for hydrolysis, photolysis and rotational crops were considered.

Hydrolysis

The test was performed to determine the hydrolysis rate of fenhexamid (PF 4098, Brumhard, 1995). The results of the investigations on the hydrolytic stability of fenhexamid in sterile buffer solutions are summarised in Table 1.

Fenhexamid was found to be stable at pH 5, 7 and 9. Under the experimental conditions over a period of 30 days no formation of hydrolysis products was observed. Considering the hydrolytic stability determined under environmental pH and temperature conditions it is not expected that hydrolytic processes will contribute to the degradation of fenhexamid in the environment.

Photolysis

The test was performed to determine the photolysis rate of fenhexamid (PF 4194, Brumhard and Bornatsch, 1996). The results of the investigations on the photochemical degradation of fenhexamid in water are summarised in Table 1.

Experimental photolytic half-life of fenhexamid in sterile aqueous buffered solution at 25 ± 1°C is 1 h. More than 14 degradation products or metabolites were observed. The main degradation product after 1 h was the benzoxazole of fenhexamid (M 10, WAK 7004) accounting for a maximum of 23.6 % of the applied radioactivity. During the continuous irradiation period of 15 days an amount equivalent to 39.3 % of the applied radioactivity was photo-mineralized to carbon dioxide (45d = 49.5 %). Recovery ranged from 90.2 to 109.4 % of the applied radioactivity.

Rotational crops – confined

The metabolism of fenhexamid was investigated in the rotational crops wheat, Swiss chard and turnips from three consecutive rotations (PF 4240, Reiner, 1997). [Phenyl-UL-^{14}C]fenhexamid was formulated as a 50 WP and applied uniformly to the soil of a planting container by spray application (day 0). The application rate corresponded to 3.5 kg ai/ha. The material was applied to bare soil compared with usual applications that would be directed on to foliage.

Crops of the first, second and third rotation were sown at day 30, day 134 and day 314, respectively. Immature samples investigated were wheat forage and hay (soft dough stage). Wheat straw and grain, Swiss chard, turnip leaves and roots were harvested at maturity. The sampling dates are given in the Table 7.

The total radioactive residues (TRRs) decreased significantly from the first to the third rotation in all raw agricultural commodities. The maximum TRR (0.73 mg/kg) was observed for Swiss chard (day 75) sown 30 days after soil application. The TRRs of the second rotation were all ≤ 0.10 mg/kg. The TRRs of the third rotation ranged from ≤ 0.01 mg/kg (turnip roots) to 0.08 mg/kg (straw, day 477). Detailed data are given in Table 7.

Table 7. Total radioactive residues in rotational crops after spray application of [phenyl-UL-^{14}C]fenhexamid (PF 4240, Reiner, 1997).

Rotational crop	Total Radioactive Residue (TRR)					
	First rotation		Second rotation		Third rotation	
	mg/kg	sampling day	mg/kg	sampling day	mg/kg	sampling day
Wheat forage	0.14	63	0.02	177	0.01	352
Wheat hay	0.17	89	0.03	239	0.03	406
Wheat straw	0.52	131	0.10	299	0.08	447
Wheat grain	0.17	131	0.04	299	0.03	447
Swiss chard	0.73	75	0.02	191	0.01	363
Turnip leaves	0.06	110	0.02	237	0.01	390
Turnip roots	0.06	110	0.02	237	≤ 0.01	390

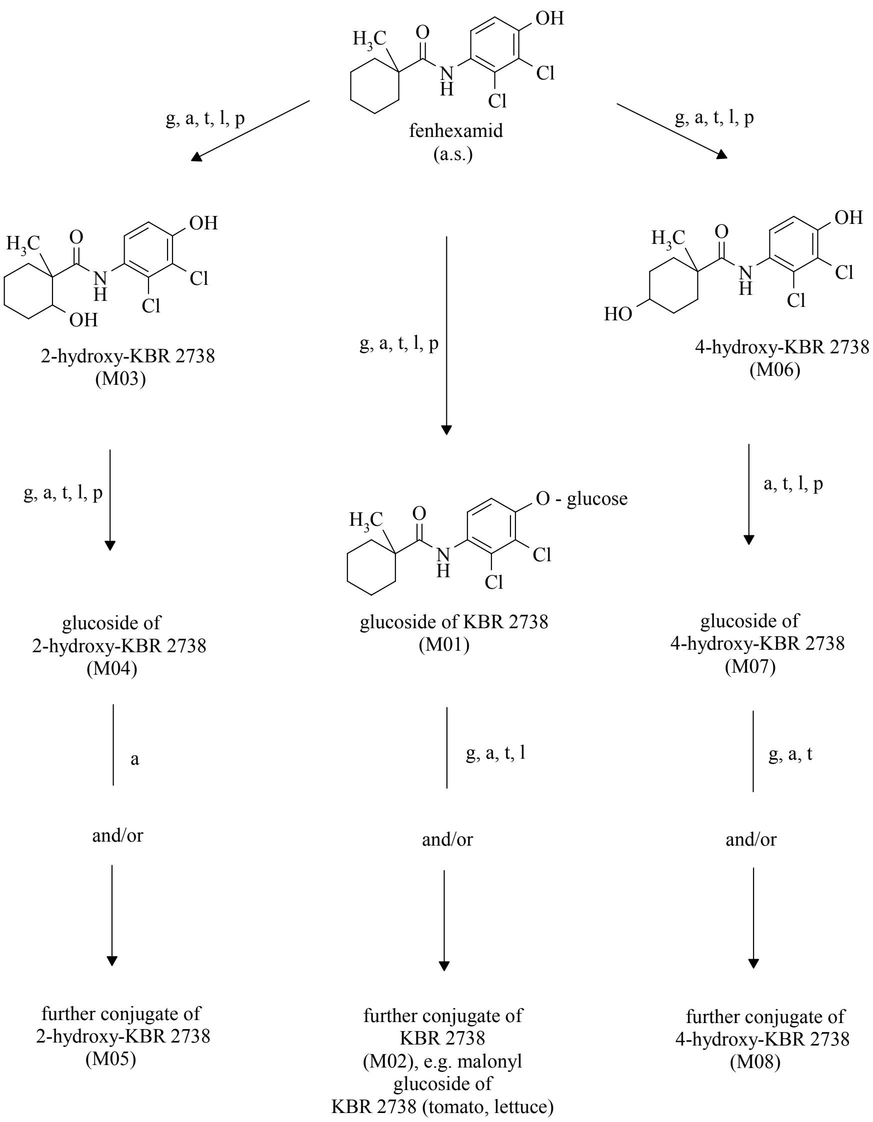


Figure 2. Proposed metabolic pathway of fenhexamid in plants (g: grapes, a: apples, t: tomatoes, l: lettuce, p: field pea).

Generally, only a relatively small amount of the TRR was extracted conventionally using methanol/water, and the active substance, detected in the dichloromethane phase, was a minor compound (2.0% of the TRR as a maximum). This was a significant difference to the results from the plant metabolism studies where fenhexamid represented the major residue at harvest. Therefore, this was an important indication for the degradation of fenhexamid in soil before root uptake by the plant. A major amount of the radioactivity (approximately 50% up to approximately 90% of the TRR) was extracted by exhaustive extraction using dioxane/2N HCl 9:1 under reflux followed by 1N KOH at room temperature. As a result, the total amount of parent compound in the first rotation ranged from 0.4% (< 0.01 mg/kg) in wheat forage to 3.7% (0.03 mg/kg) in Swiss chard (as a maximum of all samples). The distribution of radioactivity into four special fractions, which are characterised by the extraction procedure, indicated the presence of a number of components of different polarity and structure. The metabolites contained in the obtained extracts and phases were separated using chromatographic methods, where possible, showing that numerous minor compounds contributed to the metabolite pattern. Based on the extraction results, it was concluded that major amounts of the TRR were bound to the lignin or hemicellulose fractions of the plant matrix.

As Swiss chard from the first rotation showed the maximum TRR (0.73 mg/kg) of all crops, the distribution of radioactivity into fractions and the metabolite pattern was investigated intensively as a representative example. The individual amount of each of at least 30 components of the TRR in Swiss chard was either very low (e.g. 0.04 mg/kg as a maximum assigned to metabolite group 1, see Table 8) or the radioactivity remained at the TLC-origin (e.g. 0.25 mg/kg released from the lignin fraction using dioxane/HCl). Three metabolites were characterised as soil metabolites ([C-O-C] dimer of fenhexamid (M20), trimer of fenhexamid (M22) and mono-deschlor trimer of fenhexamid (M23)) each amounting to ≤ 1.5% (≤ 0.01 mg/kg). Details are given in Table 8.

Table 8. Metabolites in mature Swiss chard (first rotation) sown in soil 30 days after soil treatment with [phenyl-UL-^{14}C]fenhexamid (PF 4240, Reiner, 1997).

Metabolite	% of TRR	mg ai equiv./kg
Identified *		
Fenhexamid, parent compound (subtotal)	(3.7)	(0.03)
Fenhexamid, dichloromethane phase	2.0	0.01
Fenhexamid, dioxane/HCl extract	1.7	0.01
Characterised (subtotal)	(87.8)	(0.64)
Characterised by comparison with soil metabolites (subtotal)	(3.3)	(0.02)
Mono-deschlor trimer of KBR 2738 (*M23*), dichloromethane phase	1.5	0.01
Trimer of KBR 2738 (*M22*), dichloromethane phase	1.1	≤ 0.01
[C-O-C] dimer of KBR 2738 (*M20*), dichloromethane phase	0.7	≤ 0.01
Characterised by extraction procedure and TLC analysis (subtotal)	(74.0)	(0.54)
Unknown metabolites (named metabolite group 1 in the report), dichloromethane phase	5.3	0.04
Diffuse radioactivity 3, dichloromethane phase	2.1	0.02
At least 10 unknown components of the dichloromethane phase, each ≤ 1.9%, ≤0.01 mg/kg	9.4	0.07
Unknown metabolite (named metabolite 16 in the report), aqueous phase	2.6	0.02
Unknown metabolite(s) (named metabolite group 17 in the report), aqueous phase	2.4	0.02
Diffuse radioactivity 6, aqueous phase	2.8	0.02
At least 6 components of the aqueous phase, each ≤ 1.8%, ≤ 0.01 mg/kg	8.3	0.06
TLC-origin, aqueous phase	4.9	0.04
Unpolar compounds, dioxane/HCl extract (lignin-fraction)	2.4	0.02
Polar compounds, dioxane/HCl extract (lignin-fraction), mainly TLC-origin	33.8	0.25
Characterised by extraction procedure		
KOH extract (hemicellulose fraction), high matrix content, not chromatographed	10.5	0.08
Solids (non-extractable residue after two exhaustive extraction steps)	8.5	0.06
Total residue	100.0	0.73

*Further 1.2% (≤ 0.01 mg/kg) of the TRR was identified as 4-hydroxy-fenhexamid (M06) following total hydrolysis of Swiss chard (additional experiment).

A total hydrolysis experiment was additionally conducted to analyse for the maximum amount of 4-hydroxy-fenhexamid (M06) in Swiss chard, which resulted in 1.2% (≤ 0.01 mg/kg). Specific tests for DCHA (2,3-dichloro-4-hydroxyaniline, M34) did not detect the compound (< 0.01 mg/kg) in Swiss chard and wheat straw, which are the raw agricultural commodities containing the maximum TRRs.

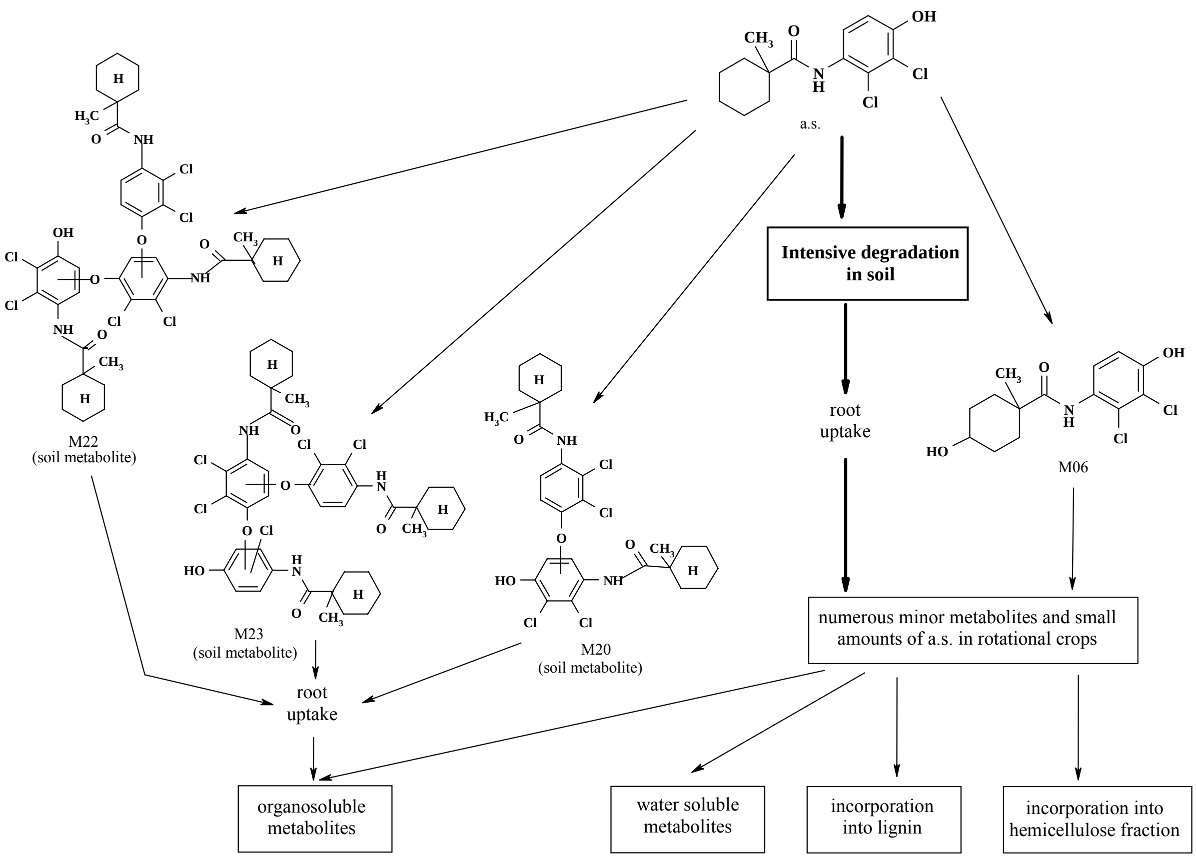
The results of the metabolism of fenhexamid in rotational crops are summarised and illustrated in the proposed metabolic pathway (see Figure 3).

The composition of the TRR in rotational crops was obviously substantially influenced by the metabolism of fenhexamid in soil and led to differences in the results obtained from plant metabolism studies in primary crops, where the radioactivity was easily extracted and consisted mainly of parent compound. In contrast, the active substance represented a small portion (max. 3.7%) at a low level (0.03 mg/kg). The hydroxylated derivative of the parent compound (4-hydroxy-fenhexamid = M06) was only of very minor importance in rotational crops (max. 1.2% (< 0.01 mg/kg) following total hydrolysis). Although the parent compound was intensively degraded in soil, no DCHA (M34) was detectable.

RESIDUE ANALYSIS

Analytical methods

The Meeting received descriptions and validation data for analytical methods for the determination of residues of fenhexamid in crop and animal commodities. Methods are summarized below and analytical recoveries are summarized in Tables 9 and 10. The methods rely on HPLC with electrochemical detection or HPLC/MS/MS and generally achieve LOQs of 0.02 - 0.05 mg/kg in crop matrices. The recoveries were in the range of 71–114% for enforcement methods and 63-120% for specialised analytical methods. For animals, the methods rely on HPLC-UV and achieve LOQs between 0.01 mg/kg (milk) and 0.05 mg/kg (egg, meat, fat). The recoveries were in the range of 67-101%.



a.s. = active substance = fenhexamid, M06 = 4-hydroxy-fenhexamid
M20 = [C-O-C] dimer of fenhexamid M22 = trimer of fenhexamid
M23 = mono-deschlor trimer of fenhexamid

Figure 3. Proposed scheme of the degradation pathway of fenhexamid in rotational crops.

Plant matrices – enforcement methods

The report MO-01-014683 by Nuesslein (1999) comprises data from enforcement method 00362 and its supplements 00362/E001, 00362/E002 and 00362/E003, which have not previously been published. The method and its supplements are described below.

Plant matrices are extracted with acetone from samples with high water content, and with a mixture of water/acetone from dry samples and cleaned up by partitioning on a ChemElut column. Fenhexamid is determined by reversed-phase HPLC with electrochemical detection using a carbon electrode and an Ag/AgCl reference electrode. Evaluation was done against external standards in solvent. For confirmatory purposes, some samples were additionally analysed by HPLC with UV detection, measured both at 246 nm and at 289 nm.

The extraction efficiency of method 00362 was tested in apples and grapes from metabolism studies with aged radioactive residues after application of phenyl-UL-^{14}C-radiolabelled active substance (MR-768/95, Reiner, 1995). Grapes (100 g) and apple (158 g) were macerated with acetone and filtered. The samples were then washed and made up to volume using acetone. Radioactivity in liquid samples was analysed by reversed-phase HPLC with a radioactivity flow through monitor and a solid scintillator glass cell. Total ^{14}C-radioactivity was determined for liquid samples (acetone extracts), and for solid samples (non-extractable residues) after combustion, using a liquid scintillation counter. The extraction efficiency was 96.4% of the total radioactive residue (TRR) in apple and 98.7% in grapes. The major component of the acetone extract was the unchanged fenhexamid parent compound as shown by HPLC comparison with the radioactively labelled parent compound. Fenhexamid parent compound amounted to 91.2% of the TRR in apple and 90.7% in grapes. The TRR for fenhexamid was 1.27 mg/kg in apple and 4.88 mg/kg in grapes.

In the following Table 9 recovery data are only cited if they were also calculated and reported in the corresponding methods. The abbreviation FL is used for fortification level, RSD specifies the relative standard deviation and ILV is used for independent laboratory validation.

Table 9. Validation data for enforcement analytical methods for determination of fenhexamid in plant matrices.

Report Reference	Matrix	FL [mg/kg]	Recovery rate [%] mean	range		RSD [%]	n
MR-144/94	Grape (fruit)	0.02	90	88	92	2.3	3
Method 00362		0.2	91	86	95	5.2	3
Bachmann and		2.0	98	97	99	1.0	3
Nuesslein, 1995	Grape (must)	0.02	108	105	110	2.4	3
		0.2	96	94	98	2.2	3
HPLC-electrochemical		2.0	99	98	100	1.2	3
detector	Grape (juice)	0.02	102	100	104	2.0	3
		0.2	99	98	99	0.6	3
		2.0	100	100	101	0.6	3
	Grape (wine)	0.02	87	83	90	4.3	3
		0.2	95	94	96	1.1	3
		2.0	101	100	104	2.3	3
	Grape (raisin)	0.05	104	99	107	4.4	3
		0.5	97	95	98	1.8	3
		5.0	97	94	100	3.2	3
	Grape (raisin waste)	0.05	97	96	98	1.2	3
		0.5	96	94	99	3.0	3
		5.0	100	99	102	1.7	3
	Grape (wet pomace)	0.05	95	93	98	2.6	3
		0.5	97	95	100	2.7	3
		5.0	97	94	101	3.6	3
	Grape (dry pomace)	0.05	91	87	95	4.4	3
		0.5	98	94	102	4.1	3
		5.0	83	83	84	0.7	3

Report Reference	Matrix	FL [mg/kg]	Recovery rate [%] mean	range		RSD [%]	n
	Strawberry (fruit)	0.05	91	88	92	2.5	3
		0.5	96	95	96	0.6	3
		5.0	98	95	99	2.4	3
	Cherry (fruit)	0.05	88	83	92	5.1	3
		0.5	86	81	91	5.8	3
		5.0	91	88	93	2.9	3
	Plum (fruit)	0.05	85	79	94	9.3	3
		0.5	89	86	92	3.4	3
		5.0	86	82	92	6.4	3
	Peach (fruit)	0.05	90	87	92	3.2	3
		0.5	94	92	95	1.6	3
		5.0	93	89	96	3.9	3
MR-302/95 Method 00362/E001 Nuesslein, 1996 HPLC-electrochemical detector	Strawberry (jam)	0.05	94	92	96	2.1	3
		0.5	91	90	91	0.6	3
		5.0	98	96	99	1.6	3
	Raspberry (fruit)	0.05	85	83	88	2.9	3
		0.5	92	91	92	0.6	3
		5.0	90	86	94	4.4	3
	Blackcurrant (fruit)	0.05	93	92	94	--	2
		0.5	82	74	91	10.4	3
		5.0	73	71	74	--	2
	Cherry (preserve)	0.05	95	95	96	0.6	3
		0.5	89	86	92	3.4	3
		5.0	93	91	94	1.9	3
	Cherry (juice)	0.02	86	84	89	2.9	3
		0.2	87	85	88	1.8	3
		2.0	87	86	87	0.7	3
	Kiwi (fruit)	0.05	98	89	107	7.7	5
		0.5	91	86	96	4.2	5
	Nectarine (fruit)	0.05	90	87	93	3.4	3
		0.5	79	71	90	12.2	3
		5.0	81	75	90	9.6	3
	Plum (dried prune)	0.05	78	76	81	3.4	3
		0.5	84	83	86	1.8	3
		5.0	86	85	87	1.2	3
	Plum (sauce)	0.05	82	79	88	6.0	3
		0.5	84	80	87	4.3	3
		5.0	85	84	87	1.8	3
	Tomato (fruit)	0.05	97	94	99	2.7	3
		0.5	98	94	100	3.5	3
		5.0	94	94	94	0.0	3
	Tomato (juice)	0.05	85	82	87	2.1	5
		0.5	91	89	93	1.8	5
	Tomato (puree)	0.05	88	86	89	1.3	5
		0.5	88	85	89	2.0	5
	Tomato (paste)	0.05	88	79	96	7.3	5
		0.5	74	69	79	5.1	5
MR-602/97 Method 00362/E002 Nuesslein, 1997 HPLC-electrochemical detector	Cucumber (fruit)	0.05	104	102	107	2.4	3
		0.5	96	94	98	2.2	3
	Red pepper (fruit)	0.05	103	102	104	1.1	3
		0.5	96	95	97	1.2	3
MR-894/98 Method 00362/E003 Nuesslein, 1999 HPLC-electrochemical detector	Lettuce (head)	0.05	99	88	106	9.7	3
		0.5	97	91	102	5.7	3

Report Reference	Matrix	FL [mg/kg]	Recovery rate [%] mean	range		RSD [%]	n
BAY-9604V ILV to method 00362 and 00362/E001 Weber, 1996 HPLC-electrochemical detector	Blackcurrant (fruit)	0.05	87	78	100	9.3	5
		1.0	87	83	91	3.8	5
	Strawberry (fruit)	0.05	87	82	93	5.4	5
		1.0	90	82	94	5.2	5
	Strawberry (jam)	0.05	94	90	95	2.3	5
		1.0	93	89	98	3.8	5
	Tomato (fruit)	0.05	83	75	93	8.2	5
		1.0	95	85	114	14	5
1510H-1 Kruplak, 1996 Method 1510H-1 HPLC-electrochemical detector	Strawberry (fruit)	0.05	85	85	85	0.0	3
		0.5	85	83	86	2.0	3
	Grape (bunches of grapes)	0.02	83	76	90	8.5	3
		0.2	86	85	87	1.3	3
TMN-019H ILV to method 1510H-1 Curry, 1997 HPLC-electrochemical detector	Grape (berry including small stems)	0.02	89	82	96	--	2
		0.2	89	88	90	--	2
TMN-019E Method 00362 Kruplak, 1996 HPLC-electrochemical detector	Peach (fruit, stems and stones removed)	0.05	87	85	90	2.9	3
		0.5	93	86	97	6.5	3
	Plum (fruit, stems and stones removed)	0.05	74	71	77	4.1	3
		0.5	96	96	97	0.6	3
	Cherry (fruit, stems and stones removed)	0.05	87	80	92	7.2	3
		0.5	100	98	102	2.0	3
TMN-019K Kruplak, J.F. 1998 modification of method 00362 HPLC-electrochemical detector	Almond (seed)	0.02	85	72	97	14.7	3
		0.2	88	86	89	1.7	3
	Almond (hull)	0.05	77	70	82	8.1	3
		0.5	83	78	89	6.7	3

Plant matrices – specialised methods

Specialised methods based on the original HPLC method 00362 (IR-4-06937, Anon. 2001; IR-4-06936, Anon. 2001; IR-4-07318, Anon. 2001; IR-4-06840, Corley, 2001; IR-4-06935, Corley, 2001; TP/112/960528, Fernandez, 1996) were used to analyse fenhexamid residues in supervised residue trials. The validation data is summarized in Table 10.

A specialised method is described for the determination of fenhexamid in plant materials by HPLC-MS/MS (MR-496/98, Nuesslein, 1998). Fenhexamid is extracted from sample material using a mixture of acetone/water (2+1, v/v). The extract is filtered, evaporated to the aqueous remainder, and partitioned on a ChemElut column. The compound is eluted from the column using a mixture of cyclohexane and ethyl acetate (85+15 v/v). The eluate is evaporated to dryness. Samples are re-dissolved in methanol/water (1+1, v/v) and diluted 1:10 with methanol/water (1+1, v/v). Fenhexamid is quantified by isocratic reversed-phase HPLC with electrospray MS/MS-detection in the positive ion mode under multiple reaction monitoring (MRM) conditions. Monitoring for fenhexamid is done at a mass charge ratio of m/z 302→97.1. Evaluation was against external standards in solvent using single-point calibration. The combination of the very selective MS/MS-detection method with the preceding clean-up and HPLC separation steps leads to a high specificity of the method. The validation data are summarized in Table 10.

A method (NR 1297, Kido and Kobori, 1995) was developed for analysis of fenhexamid in plant materials by gas chromatography with nitrogen phosphorous detector (GC-NPD). The sample material is homogenised, acidified and extracted using acetone. The extracts are partitioned with dichloromethane. The solvent is evaporated and the residue dissolved in a mixture of dichloromethane, 0.1 N sodium hydroxide and methyl iodide. For derivatization, tetra-n-butylammonium hydrogen sulphate is added and the mixture stirred for one hour. The mixture is acidified (pH<1), extracted with n-hexane and purified by column chromatography. Solvent was evaporated to dryness, the residue dissolved in acetone and injected to the GC. Evaluation was done against external calibration standards in solvent. The validation data are summarized in Table 10. The abbreviation FL is used for fortification level, RSD specifies the relative standard deviation and ILV is used for independent laboratory validation.

Table 10. Validation data for specialised analytical methods for determination of fenhexamid in plant matrices.

Report, Reference Method	Matrix	FL [mg/kg]	Recovery rate [%]			RSD [%]	N
			mean	range			
MR-496/98	Grape (fruit)	0.02	96	90	107	9.9	3
Method 00516		0.2	94	90	97	3.8	3
Nuesslein, F. 1998b		2.0	88	87	89	1.1	3
	Red pepper (fruit)	0.05	92	86	97	6.1	3
HPLC-MS/MS		0.5	83	80	88	5.0	3
		5.0	78	73	82	5.8	3
	Tomato (fruit)	0.05	92	90	94	2.3	3
		0.5	91	88	96	4.6	3
		5.0	87	85	89	2.4	3
	Cucumber (fruit)	0.05	72	69	75	3.2	5
		0.5	67	63	70	3.9	5
		5.0	74	73	75	1.1	5
IR-4-06937	Cherry (pitted fruit)	0.1	107	100	110	6	3
Method (modif. 00362)		1.0	94	89	96	4	3
Anon 2001		10.0	100	99	100	1	3
HPLC-UV							
IR-4-06936	Peach (fruit)	1.0	97	91	110	8.3	5
Method (modif. 00362)							
Anon 2001		10.0	97	96	98		2
HPLC-UV							
IR-4-07318	Plum (fruit)	0.1	120	120	120		2
Method (modif. 00362		1.0	91	89	94	2.8	3
Anon 2001		10.0	82	82	82		1
HPLC-UV							
IR-4-06840	Caneberry (berry)	0.02	95	92	97	2	3
Method (modif. 00362)		0.5	91	90	92	1	3
Corley, 2001		5.0	96	94	101	4	3
HPLC-MS/MS							
IR-4-06935	Blueberry (berry)	0.02	80	72	85	7	3
Method (modif. 00362)		0.5	92	91	93	1	3
Corley, 2001		5.0	90	86	96	5	3
HPLC-MS/MS							
NR 1297	Eggplant (fruit)	0.02	70	64	76	8.6	3
Kido and Kobori, 1995		0.2	79	78	79	0.7	3
GC-NPD	Strawberry (fruit)	0.2	103	102	104	1.1	3
		5.0	92	89	94	2.7	3

Animal matrices

Animal matrices can be extracted with acetonitrile or n-hexane and cleaned up by liquid-liquid partitioning and further by column chromatography on a silica gel column. Fenhexamid is determined by reversed-phase HPLC with variable-wavelength UV detection.

In the following Table 11, recovery data is only cited if they were also calculated and reported in the corresponding methods. The abbreviation FL is used for fortification level, RSD specifies the relative standard deviation and ILV is used for independent laboratory validation.

Table 11. Validation data for enforcement analytical methods for determination of fenhexamid in animal matrices.

Report, Reference Method	Matrix	FL [mg/kg]	Recovery rate [%]			RSD [%]	n
			mean	range			
MR-695/96	Egg	0.05	97	95	101	2.5	5
Method 00457		0.5	91	84	97	5.7	5
Maasfeld, 1996	Milk	0.01	82	76	89	6.0	5
		0.1	85	80	91	5.5	5
HPLC-UV	Fat	0.05	93	85	101	6.5	5
		0.5	94	88	97	4.1	5
MR-593/98	Meat	0.05	97	92	101	4.4	4
Method 00457/E001							
Nuesslein, 1998		0.5	93	92	95	1.5	5
HPLC-UV							
BAY-9701V	Egg	0.05	77	67	99	17	5
ILV to Method 00457		0.5	84	82	87	2	5
Weber, 1997	Milk	0.01	84	72	96	13	5
		0.1	78	68	90	13	5
HPLC-UV	Fat	0.05	84	78	97	10	5
		0.5	81	75	89	6	5

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of residues of fenhexamid in various plant matrices at freezer temperatures. No significant decrease of residues was observed after the storage period of 12 to 17 months. Thus the residues of fenhexamid are stable under freezer storage conditions for at least 5.5 months (almond meat), 8.5 months (almond hulls) or 12 months. Hence, the results of these storage stability studies validate the results from the residue trials, with respect to the stability of fenhexamid in frozen samples. For details, see Table 12. The abbreviation FL is used for fortification level.

In study TMN-019E (Kruplak, 1996), samples of peaches, plums, and cherries were fortified with 0.05 to 0.5 mg/kg fenhexamid. Immediately after fortification, a sample from each matrix was taken to determine the initial residues. The remaining fortified samples were deep frozen (approximately -20°C) and analysed after storage intervals of 2–4 months. In study TMN-019Z (Kruplak, 1997), the other fortified samples were analysed after storage of 12–14 month.

In study 1501H-1 (Kruplak, 1996) samples of strawberries and grapes were fortified with 0.05 to 0.5 or 0.02 to 0.2 mg/kg fenhexamid. Immediately after fortification, a sample from each matrix was taken to determine the initial residues. The remaining fortified samples were deep frozen (at approximately -20°C) and analysed after storage intervals of 3–4 months. In study TMN-020 (Kruplak, 1997), the other fortified samples were analysed after storage of approximately 17 months.

In study TMK-019K (Kruplak, 1998), samples of almond hulls and meat were fortified with 0.05 to 0.5 or 0.02 to 0.2 mg/kg fenhexamid. Immediately after fortification, a sample from each matrix was taken to determine the initial residues. The remaining fortified samples were deep frozen (approximately -20°C). Almond meat samples were analysed after storage intervals of 8.5 months and almond hulls samples were analysed after storage intervals of 1 and 5.5 months.

In study MR-603/96 (Nuesslein, 1996), samples of grapes and the processed commodities of grapes (juice, raisin and raisin waste), peaches, tomatoes and strawberries were fortified with 0.5 mg/kg fenhexamid. After fortification a sample from each matrix was taken to determine the initial residues. The remaining fortified samples were held in frozen storage at –18 °C or below and analysed at nominal intervals of 1, 3, 6 and 12 months.

Table 12. Storage stability of fenhexamid in plant matrices stored below –18°C.

Commodity	FL (mg/kg)	Storage interval (month)	Fresh fortification recovery (%)	Remaining residue in stored sample (%)	Report No. Reference
Peaches	0.05	0 4.5 13	87 93 91	 88 83	TMN-019E and TMN-019Z Kruplak, 1996 and 1997
	0.5	0 4.5 13	93 85 102	 87 91	
Plum	0.05	0 4 12	74 93 91	 93 81	TMN-019E and TMN-019Z Kruplak, 1996 and 1997
	0.5	0 4 12	96 100 98	 85 91	
Cherry	0.05	0 2 3.25 14	- 87 89 83	 71 82 75	
	0.5	0 2 3.25 14	- 100 100 94	 88 88 82	
Strawberry	0.05	0 4.3 17.5	85 103 87	 107 87	1501H-1 and TMN-020 Kruplak, 1996 and 1997
	0.5	0 4.3 17.5	85 - 91	 103 92	
Grapes	0.02	0 3.3 17	83 89 112	 76 99	
	0.2	0 3.3 17	86 - 101	 98 93	
Almond, meat	0.02	0 8.5	85 75	 66	TMN-019K Kruplak, 1998
	0.2	0 8.5	88 82	75	
Almond, hulls	0.05	0 1.25 5.5	77 78 79	 61 82	
	0.5	0 1.25 5.5	83 83 74	 70 75	
Grape, berry	0.5	0 1 3 6 12	94 93 96 95 95	97 96 82 88 96	MR-603/96 Nuesslein, 1996
Grape, juice	0.5	0 1 3	98 107 106	103 100 100	

Commodity	FL (mg/kg)	Storage interval (month)	Fresh fortification recovery (%)	Remaining residue in stored sample (%)	Report No. Reference
		6 12	99 98	95 102	
Grape, raisin	0.5	0 1 3 6 12	107 106 109 101 104	108 108 108 106 102	
Grape, raisin waste	0.5	0 1 3 6 12	92 98 110 76 90	85 89 107 82 111	
Peach, fruit	0.5	0 1 3 6 12	95 101 93 99 97	92 93 96 86 88	
Tomato, fruit	0.5	0 1 3 6 12	97 105 103 98 93	99 104 95 93 97	MR-603/96 Nuesslein, 1996
Strawberry, fruit	0.5	0 1 3 6 12	100 101 105 98 100	100 103 88 99 96	

Storage stability of fenhexamid in supervised residue trials

Residue trials with fenhexamid were conducted in/on crops of the following groups: citrus fruit, stone fruit, berries and other small fruits, assorted fruits - inedible peel (kiwi), fruiting vegetables, leafy vegetables and tree nuts. The maximum storage period for all samples from trials included in the evaluation is given in Table 13. Fenhexamid was generally stable for the duration of storage.

Table 13. Maximum storage period of sample materials.

Study No.	Trial Sub ID	Targets	Sample Material	Storage Period	
				Days	Months
NR96047	NR96047-A1	lemon	fruit	35	1.2
NR96035	NR96035-B	mandarin	peel	175	5.8
NR96035	NR96035-B	mandarin	pulp	175	5.8
IR-4-06937	06937.00-WA34-C	cherry	fruit, depitted	197	6.6
RA-2092/95	0580-95	cherry, sour	fruit	223	7.4
RA-3013/98	1017-98	cherry, sour	whole fruit, washed	148	4.9
RA-3050/95	0048-95	cherry, sweet	juice	141	4.7
RA-3013/98	1017-98	cherry, sour	preserve	148	4.9
RA-2046/95	0505-95	nectarine	fruit	286	9.5
RA-2046/95	0075-95	peach	fruit	287	9.6
RA-2048/95	0438-95	plum	fruit	250	8.3
RA-3048/95	0051-95	plum	whole fruit, washed	90	3.0
RA-3048/95	0051-95	plum	sauce	90	3.0
RA-3048/95	0051-95	plum	prune	90	3.0
RA-2057/95	0142-95	grape	segment of a bunch of grapes	308	10.3

Study No.	Trial Sub ID	Targets	Sample Material	Storage Period Days	Months
RA-3045/94	0185-94	grape	juice	363	12.1
RA-3056/95	0146-95	grape	must	249	8.3
RA-3045/94	0186-94	grape	wine	346	11.5
RA-3045/94	0185-94	grape	pomace, dried	363	10.9
RA-3045/94	0185-94	grape	raisin	363	12.1
RA-3045/94	0185-94	grape	raisin waste	363	12.1
RA-2054/95	0034-95	strawberry	fruit	350	11.7
RA-3053/95	0037-95	strawberry	whole fruit, washed	136	4.5
RA-3053/95	0037-95	strawberry	jam	132	4.4
IR-4-06840	06840.00-NC20	raspberry	berry	280	9.3
IR-4-06840	06840.00-OR06	blackberry	berry	216	7.2
IR-4-06935	06935.00-NC21	blueberry	berry	294	9.8
RA-2051/95	0508-95	currant, black	fruit	243	8.1
RA-2045/95	0170-95	kiwi	fruit	191	6.4
RA-2026/97	0314-97	cucumber	fruit	274	9.1
Saku8P-4-100	Saku8P-4-100-A	aubergine	fruit	120	4.0
RA-2031/97	0140-97	tomato	fruit	379	12.6
RA-3035/96	0461-96	tomato	whole fruit, washed	58	1.9
RA-3035/96	0461-96	tomato	juice	58	1.9
RA-3035/96	0461-96	tomato	preserve	58	1.9
RA-3035/96	0461-96	tomato	paste	58	1.9
RA-2027/97	0318-97	pepper, sweet	fruit	310	10.3
RA-2032/00	0262-00	lettuce	head	321	10.7
TMN-020-1	T402-ALM97-214	almond	hull	157	5.2
TMN-020-1	T402-ALM97-214	almond	nut without shell	55	1.8

USE PATTERN

Fenhexamid is a protectant fungicide, active against a specific range of diseases. Used protectively as a spray application, fenhexamid has been shown to be highly effective against *Botrytis* spp. (especially *Botrytis cinerea*), *Monilinia* spp. and *Sclerotinia* spp. In co-formulations with other fungicides, a broader range of diseases is controlled. Fenhexamid can be applied to a wide range of agricultural and horticultural crops in temperate, sub-tropical and tropical climates, grown in open fields or protected under glass. Fenhexamid is also used for post-harvest protection of fruit from diseases developing during transport and storage. Labels from countries of relevance, including all uses on crops which are supported by residue data, were submitted together with summaries of the application conditions (GAP) and English language translations where necessary. Information on registered uses on fruits and tree nuts is summarized in Table 14 and on vegetables in Table 15. If not otherwise mentioned, the use is in the field (outdoor).

Table 14. Registered uses of fenhexamid on fruits and tree nuts.

Crop	Country [1]	Form. WG % SC g/L	Application					PHI, days
			Method [2]	Timing	Rate kg ai/ha	Conc. kg ai/hL	No.	
Almond	USA L	WG 14.3	foliar spray	up to 28 days after petal fall	0.56-0.84		1-4	30
	USA L	WG 50	foliar spray	up to 28 days after petal fall	0.56-0.84		1-4	
Apricot	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	1-4	1
	Switzerland L	WG 50	foliar spray		0.8	0.05 [3]	1-2	10-21 [4]
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Berries apart from	Germany L	WG 50	foliar spray		1.0	0.1	1-4	7
strawberry and grapes	Austria L	WG 50	foliar spray		1.0	0.1	1-4	7
Bilberry and similar	Austria L	WG 50	spray		1.0	0.1	1-4	7
	Canada L	WG 50	spray		0.85		1-4	1
	Croatia L	SC 500	spray		0.5 - 0.75		1-2	7
	Netherlands L	WG 50	spray		0.75		> 1 [5]	7
	Norway L	WG 50	spray	before formation of unripe fruit		0.075	> 1 [6]	
	Slovenia L	SC 500	spray		1.0		1-4	7
	Switzerland L	WG 50	spray		1.0	0.1	1-2	7
	USA L	WG 14.	spray		0.56-0.76		1-4	0
	USA L	WG 50	spray		0.84		1-4	0
Cane fruit	Austria L	WG 50	foliar spray		1.0	0.1	1-4	7
(blackberry	Belgium L	WG 50	foliar spray		0.5		1-3	7
raspberry	Canada L	WG 50	foliar spray		0.85		1-4	1
loganberry)	Croatia L	SC 500	foliar spray		0.5-0.75		1-2	10
	Finland L	WG 50	foliar spray		0.75		1-2	7
	Hungary L	SC 500	foliar spray		0.5		1-3	7
	Netherlands L	WG 50	foliar spray		0.75		> 1 [7]	7
	Norway L	WG 50	foliar spray			0.075	> 1 [8]	14
	Poland L	SC 500	foliar spray		0.75			1
	Serbia L	SC 500	foliar spray		0.5-0.75		1-2	
	Slovenia L	SC 500	foliar spray		1		1-4	7
	Sweden L	WG 50	foliar spray		0.75		1	7
	Switzerland L	WG 50	foliar spray		1	0.1	1-2	7
	UK L	WG 16.7	foliar spray		0.5		1-4	14
	UK L	WG 50	foliar spray		0.75		1-4	1
	USA L	WG 50	foliar spray		0.84		1-4	0
Cherry	Austria L	WG 50	foliar spray		0.5-0.75	0.05	1-3	3
	Belgium L	WG 50	foliar spray		0.5	0.05 [9]	1-3	3
	Canada L	WG 50	foliar spray		0.85		1-4	1
	Croatia L	SC 500	foliar spray		0.5-0.75		1-3	2
	Denmark L	WG 50	foliar spray		0.75		1-2	7
	Germany L	WG 50	foliar spray		0.25	0.05 [10]	1-3	3
	Hungary L	SC 500	foliar spray		0.5	0.03-0.05	1-3	3
	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	1-4	1
	Japan L	WG 50	foliar spray			0.035-0.05	1-2	1

[1] L: Label provided
[2] G: use in glasshouse or under cover. F + G: use in the field and under cover. Po: Post harvest use.
[3] per 10000 m^3 of tree volume
[4] 10 day PHI applies to crops grown without rain protection
[5] No maximum number of applications stated; spray at 10-14 day intervals
[6] As required at 1-2 week intervals from beginning of blossoming to formation of unripe fruit.
[7] No maximum number of applications stated; spray at 10-14 day intervals
[8] As required at 1-2 week intervals from beginning of blossoming to formation of unripe fruit.
[9] per ha of vertical crop height
[10] per 1 m of crown height

Crop	Country [1]	Form. WG % SC g/L	Application					PHI, days
			Method [2]	Timing	Rate kg ai/ha	Conc. kg ai/hL	No.	
	Netherlands L	WG 50	foliar spray		0.5-0.75	0.05	1-3	3
	Norway L	WG 50	foliar spray			0.075	1-2	14
	Slovenia L	SC 500	foliar spray		0.25 [11]		1-3	3
	Sweden L	WG 50	foliar spray		0.75		2-3	7
	Switzerland L	WG 50	foliar spray		0.8	0.05 [12]	1-2	10-21 [13]
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
	USA L	WG 50	dip/spray (Po)	30s contact time		0.09 [14]	1	
Citrus	Japan L	WP 30	foliar spray			0.03	1-2	14
	Japan L	WG 50	foliar spray			0.035-0.05	1-2	14
Currant	Austria L	WG 50	foliar spray		1.0	0.1	1-4	7
	Belgium L	WG 50	foliar spray		0.5		1-3	7
	Canada L	WG 50	foliar spray		0.85		1-4	1
	Finland L	WG 50	foliar spray	before harvesting: not less than 1week after the end of blossoming	0.75		> 1	
	Netherlands L	WG 50	foliar spray		0.75		> 1 [15]	7
	Norway L	WG 50	foliar spray	during and after flowering, to unripe fruit		0.075	> 1 [16]	
	Slovenia L	SC 500	foliar spray		1		1-4	7
	Sweden L	WG 50	foliar spray		0.75		1	7
	Switzerland L	WG 50	foliar spray		1	0.1	1-2	7
	UK L	WG 16.7	foliar spray		0.5		1-2	21
	UK L	WG 50	foliar spray		0.75		1-4	7
	USA L	WG 50	foliar spray		0.84		1-4	0
Elderberry	Austria L	WG 50	foliar spray			0.1	1-4	7
	Canada L	WG 50	foliar spray		0.85		1-4	1
Gooseberry	Austria L	WG 50	foliar spray		1.0	0.1	1-4	7
	Belgium L	WG 50	foliar spray		0.5		1-3	7
	Canada L	WG 50	foliar spray		0.85		1-4	1
	Finland L	WG 50	foliar spray	before harvesting: not less than 1week after the end of blossoming	0.75		> 1	
	Netherlands L	WG 50	foliar spray		0.75		> 1 [17]	7
	Norway L	WG 50	foliar spray	during and after flowering, to unripe fruit		0.075	> 1 [18]	
	Slovenia L	SC 500	foliar spray		1		1-4	7
	Sweden L	WG 50	foliar spray		0.75		1	7
	Switzerland L	WG 50	foliar spray		1	0.1	1-2	7
	UK L	WG 16.7	foliar spray		0.5		1-2	21
	UK L	WG 50	foliar spray		0.75		1-4	7
	USA L	WG 50	foliar spray		0.84		1-4	0

[11] per 1 m of crown height
[12] per 10000 m^3 of tree volume
[13] 10 day PHI applies to crops grown without rain protection
[14] 0.34 kg ai in 378.5 L water, wax/oil emulsion or aqueous dilution of wax/oil emulsion to 11300 kg of fruit
[15] No maximum number of applications stated; spray at 10-14 day interval.
[16] As required at 1-2 week intervals from beginning of blossoming to formation of unripe fruit.
[17] No maximum number of applications stated; spray at 10-14 day interval.
[18] As required at 1-2 week intervals from beginning of blossoming to formation of unripe fruit.

Crop	Country [1]	Form. WG % SC g/L	Application					PHI, days
			Method [2]	Timing	Rate kg ai/ha	Conc. kg ai/hL	No.	
Grape	Australia L	SC 500	foliar spray			0.05 high vol. 0.25 low vol.	1-2	21
	Austria L	WG 50	foliar spray			0.08	1-2	21
	Belgium L	WG 50	foliar spray	Latest application when grapes are pea-sized	0.2-0.8		1-2	
	Canada L	WG 50	foliar spray		0.56		1-3	7
	Croatia L	SC 500	foliar spray		0.5-0.75		1-2	wine 21 table 14
	Czech Republic L	SC 500	foliar spray		wine: 0.38-0.5			14
	France L	WG 50	foliar spray		0.75		1	14
	Germany L	WG 50	foliar spray		0.8	0.05	1-2	21
	Greece L	WG 50	foliar spray		0.5-0.75		1-2	wine 14 table 7
	Hungary L	SC 500	foliar spray		0.375-0.5		> 1	7
	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	1-2	7
	Japan L	WG 50	foliar spray			0.035-0.05	1-2	14
	Korea L	SC 30.5	foliar spray			0.02	1-3	20
	Macedonia	SC 500	foliar spray		0.5-0.75			14-21
	Netherlands L	WG 50	foliar spray		0.75	0.05	> 1[19]	21
	New Zealand L	SC 500	foliar spray		0.38	0.038	1-2	21
	Portugal L	WG 50	foliar spray		0.75	0.075	1-2	wine 21 table 14
	Romania L	SC 500	foliar spray		0.4-0.5		2-3	wine 14 table 7
	Serbia L	SC 500	foliar spray		0.5	0.05	1-2	
	Slovakia L	SC 500	foliar spray		0.5	0.05	1-2	
	Slovenia L	SC 500	foliar spray		0.5-0.75		1-2	wine 21 table 14
	South Africa L	SC 500	foliar spray		table grape 0.38-0.56	0.038	1-3	3
	South Africa L	SC 500	foliar spray		wine grape 0.28-0.56	0.038	1-3	7
	Spain L	WG 50	foliar spray		0.5	0.1	1-2	14
	Switzerland L	WG 50	foliar spray	shortly before bunch closure or at the start of softening the berries	0.75	0.06	1	
	Turkey L	SC 500	foliar spray			0.05	1-2	7
	Turkey L	WP 50	foliar spray			0.05	1-2	wine 14 table 7
	UK L	WG 50	foliar spray		0.75		1-2	21
	USA L	WG 50	foliar spray		0.56		1-3	0
Juneberry	USA L	WG 50	foliar spray		0.84		1-4	0
Lingonberry	USA L	WG 50	foliar spray		0.84		1-4	0
Kiwi	Greece L	WG 50	dip (Po)			0.05	1	60
	Italy L	WG 50	spray / dip (Po)			0.06	1	60
	USA L	WG 50	spray (Po)			0.45-1.13[20]	1	
	USA L	WG 50	dip (Po)	20-30 s contact time		0.09[21]	1	
Nectarine	Canada L	WG 50	foliar spray		0.85		1-4	1
	Croatia L	SC 500	foliar spray		0.5-0.75		1-3	2

[19] No maximum number of applications stated; spray at 10-14 day intervals
[20] Post-harvest spray on packing line: 0.34 kg ai in 30-76 l water, to treat 90700 kg of fruit
[21] Post-harvest dip: 0.34 kg ai in 378.5 l water

Crop	Country [1]	Form. WG % SC g/L	Application					PHI, days
			Method [2]	Timing	Rate kg ai/ha	Conc. kg ai/hL	No.	
	Hungary L	SC 500	foliar spray		0.5	0.03-0.05	1-3	3
	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	2-4	1
	Japan L	WP 30	foliar spray			0.021	1-2	1
	Japan L	WG 50	foliar spray			0.035-0.05	1-2	1
	Korea L	SC 30.5	foliar spray			0.015	1-4	20
	Slovenia L	SC 500	foliar spray		0.75		1-2	3
	Switzerland L	WG 50	foliar spray		0.8	0.05 [22]	1-2	10-21 [23]
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Peach	Canada L	WG 50	foliar spray		0.85		1-4	1
	Croatia L	SC 500	foliar spray		0.5-0.75		1-3	4
	Hungary L	SC 500	foliar spray		0.5	0.03-0.05	1-3	3
	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	2-4	1
	Japan L	WP 30	foliar spray			0.021	1-2	1
	Japan L	WG 50	foliar spray			0.035-0.05	1-2	1
	Korea L	SC 30.5	foliar spray			0.015	1-4	20
	Slovenia L	SC 500	foliar spray		0.75		1-2	3
	Switzerland L	WG 50	foliar spray		0.8	0.05 [24]	1-2	10-21 [25]
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Pistachio	USA L	WG 50	foliar spray	up to 28 days after petal fall	0.56-0.84		1-4	
Plum	Austria L	WG 50	foliar spray		0.5-0.75	0.05	1-3	3
	Belgium L	WG 50	foliar spray		0.5	0.05 [26]	1-3	3
	Croatia L	SC 500	foliar spray		0.5-0.75		1-3	4
	Germany L	WG 50	foliar spray		0.25	0.05 [27]	1-3	3
	Italy L	WG 50	foliar spray		0.5-0.75	0.05-0.075	2-4	1
	Japan L	WG 50	foliar spray			0.035	1-2	1
	Netherlands L	WG 50	foliar spray		0.5-0.75	0.05	1-3	3
	Norway L	WG 50	foliar spray			0.075	1-2	28
	Slovenia L	SC 500	foliar spray		0.25 [28]		1-3	3
	Sweden L	WG 50	foliar spray		0.75		1-2	7
	Switzerland L	WG 50	foliar spray		0.8	0.05 [29]	1-2	10-21 [30]
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Plumcot	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Prunes, fresh	USA L	WG 50	foliar spray		0.56-0.84		1-4	0
Salal	USA L	WG 50	spray		0.84		1-4	0
Stone fruit	USA L	WG 50	spray (Po)			1.13 [31]	1	
(apricot, peach, nectarine, plum, prune, plumcot)	USA L	WG 50	dip (Po)	30s contact time		0.09 [32]	1	
Strawberry	Australia L	SC 500	foliar spray		0.5	0.05	> 2 [33]	
	Austria L	WG 50	foliar spray		1.0	0.05	1-3	3
	Belgium L	WG 50	foliar spray		0.75		1-3	1
	Canada L	WG 50	foliar spray		0.85		1-4	1
	Croatia L	SC 500	foliar spray		0.75		1-2	4
	Denmark L	WG 50	foliar spray		0.75		1-2	10
	Finland L	WG 50	foliar spray		0.75		1-2	3

22 per 10000 m^3 of tree volume
23 10 day PHI applies to crops grown without rain protection
24 per 10000 m^3 of tree volume
25 10 day PHI applies to crops grown without rain protection
26 per ha of vertical crop height
27 per 1 m of crown height
28 per 1 m of crown height
29 per 10000 m^3 of tree volume
30 10 day PHI applies to crops grown without rain protection
31 Post harvest low volume spray: 0.34 kg ai in 30 L water to 90700 kg of fruit
32 Post harvest dip: 0.34 kg ai in 378.5 l water, wax/oil emulsion or aqueous dilution of wax/oil emulsion to 90700 kg of fruit
33 No more than two successive sprays; no maximum number given

Crop	Country [1]	Form. WG % SC g/L	Application					PHI, days
			Method [2]	Timing	Rate kg ai/ha	Conc. kg ai/hL	No.	
	France L	WG 50	foliar spray		0.75		1-2	3
	Germany L	WG 50	foliar spray		1	0.05	1-2	3
	Greece L	WG 50	foliar spray (F+G)		0.75		1-3	1
	Hungary L	SC 500	foliar spray		0.5		1-3	7
	Israel L	SC 500	foliar spray (G)		0.75			3
	Italy L	WG 50	foliar spray (F+G)		0.5-0.75	0.05-0.075	> 1 [34]	1
	Japan L	WP 30	foliar spray			0.015	1-2	1
	Japan L	WG 50	foliar spray			0.015-0.025	1-3	1
	Korea L	WP 50	foliar spray			0.05	1-3	3
	Macedonia	SC 500	foliar spray		0.5-0.75			
	Netherlands L	WG 50	foliar spray (F)		0.75		> 1 [35]	1
	Netherlands L	WG 50	foliar spray (G)		0.6	0.05	> 1 [36]	1
	Norway L	WG 50	foliar spray (F)			0.075	1-2	7
	Norway L	WG 50	foliar spray (G)			0.075	1-2	21
	Poland L	SC 500	foliar spray		0.75			1
	Portugal L	WG 50	foliar spray		0.75	0.075	1-3	3
	Romania L	SC 500	foliar spray		0.75		3-4	3
	Slovakia L	SC 500	foliar spray		0.75		1-3	3
	Slovenia L	SC 500	foliar spray		0.75		1-3	3
	Spain L	WG 50	foliar spray		0.75		1-4	1
	Sweden L	WG 50	foliar spray		0.75		2-3	7
	Switzerland L	WG 50	foliar spray		1	0.1	1-2	7
	Turkey L	SC 500	foliar spray			0.05	1-3	3
	UK L	WG 16.7	foliar spray		0.5		1-4	14
	UK L	WG 50	foliar spray		0.75		1-4	1
	USA L	WG 14.3	foliar spray		0.56-0.84		1-4	0
	USA L	WG 50	foliar spray		0.56-0.84		1-4	0

Table 15. Registered uses of fenhexamid on vegetables.

Crop	Country	Form. WG % SC g/L	Application				PHI, days
			Method	Rate kg ai/ha	Conc. kg ai/hL	No.	
Chilli pepper	Netherlands L	WG 50	foliar spray (G)		0.05	> 1 [37]	1
Cucumber	Austria L	WG 50	foliar spray (G)	0.75		1-3	3
	Hungary L	SC 500	foliar spray	0.5	0.03-0.05	1-4	1
	Israel L	SC 500	foliar spray (G)	0.75	0.075		3
	Netherlands L	WG 50	foliar spray (G)		0.05	> 1 [38]	1
	Norway L	WG 50	foliar spray		0.075		
	Romania L	SC 500	foliar spray (F)	0.4		1-3	3
	USA L	WG 50	foliar spray (G)	0.84		1-4	0
Egg plant	Austria L	WG 50	foliar spray (G)	0.75		3	3
	Israel	SC 500	foliar spray (G)	0.75	0.075		3

[34] Treat every 10 – 14 days; maximum number of applications not specified
[35] No maximum number of applications stated; spray at 7-10 day intervals
[36] No maximum number of applications stated; spray at 7-10 day intervals
[37] No maximum number of applications stated; spray at 10-14 day intervals
[38] No maximum number of applications stated; spray at 10-14 day intervals

Crop	Country	Form. WG % SC g/L	Application				PHI, days
			Method	Rate kg ai/ha	Conc. kg ai/hL	No.	
	Italy L	WG 50	foliar spray (F+G)	0.5-0.75	0.05-0.075	> 1[39]	1
	Netherlands L	WG 50	foliar spray (G)	0.25-0.75	0.05	> 1[40]	1
	USA L	WG 50	foliar spray (G)	0.56-0.84		1-4	0
Endive	USA L	WG 50	foliar spray (G)	0.84		1-2	3
Gherkin	Netherlands L	WG 50	foliar spray (G)		0.05	> 1[41]	1
Ground cherry	USA L	WG 50	foliar spray (G)	0.84		1-4	0
Herbs	Austria L	WG 50	foliar spray (F+G)	0.75		1-2	7
Leafy vegetables (amaranth; arugula; chervil; chrysanthemum, edible-leaved and garland; corn salad; cress, garden and upland; dandelion; dock; endive; lettuce; orach; parsley; purslane, garden and winter; radicchio)	USA L	WG 50	foliar spray (G)	0.84		1-2	3
Lettuce	Austria L	WG 50	foliar spray (F+G)	0.75		1-2	7
	Canada L	WG 50	foliar spray (G)	0.75		1-2	3
	Hungary L	SC 500	foliar spray	0.5	0.03-0.05	> 1[42]	3
	USA L	WG 50	foliar spray (G)	0.84		1-2	3
Pepino	USA L	WG 50	foliar spray (G)	0.84		1-4	0
Peppers	Austria L	WG 50	foliar spray (G)	0.75		1-3	3
	Israel L	SC 500	foliar spray (G)	0.75	0.075		3
	Netherlands L	WG 50	foliar spray (G)	0.25-0.75	0.05	> 1[43]	1
	Norway L	WG 50	foliar spray	0.75			
	USA L	WG 50	foliar spray (G)	0.84		1-4	0
Squash,	Austria L	WG 50	foliar spray (G)	0.75		1-3	3
Summer	Netherlands L	WG 50	foliar spray (G)	0.25-0.75	0.05	> 1[44]	1
Tomatillo	USA L	WG 50	foliar spray (G)	0.84		1-4	0
Tomato	Austria L	WG 50	foliar spray (G)	0.5-1 [45]		1-3	3
	Canada L	WG 50	foliar spray (G)	0.75		1-3	1
	Croatia L	SC 500	foliar spray (F)	0.5-0.75		1-3	4
	France L	WG 50	foliar spray (F)	0.75		1-2	3
	Germany L	WG 50	foliar spray (G)	0.5-1 [46]		1-3	3
	Greece L	WG 50	foliar spray (G)		0.075	1-3	1
	Hungary L	SC 500	foliar spray	0.5	0.03-0.05	1-4	3
	Israel L	SC 500	foliar spray (G)	0.75	0.075		3
	Italy L	WG 50	foliar spray (F+G)	0.5-0.75	0.05-0.075	> 1[47]	1

[39] No maximum number of applications stated; spray at 10-14 day intervals
[40] No maximum number of applications stated; spray at 10-14 day intervals
[41] No maximum number of applications stated; spray at 10-14 day intervals
[42] No maximum number of sprays given. Instruction is to repeat the spray several times at 7-10 day intervals
[43] No maximum number of applications stated; spray at 10-14 day intervals
[44] No maximum number of applications stated; spray at 10-14 day intervals
[45] Depending on crop height
[46] Depending on crop height
[47] No maximum number of applications stated; spray at 10-14 day intervals

Crop	Country	Form. WG % SC g/L	Application				PHI, days
			Method	Rate kg ai/ha	Conc. kg ai/hL	No.	
	Korea L	WP 50	foliar spray		0.05	1-3	7
	Netherlands L	WG 50	foliar spray (G)	0.25-0.75	0.05	> 1[48]	1
	Norway L	WG 50	foliar spray (F+G)		0.075	1-2	4
	Portugal L	WG 50	foliar spray (G)	0.75	0.075	1-3	3
	Romania L	SC 500	foliar spray (F)	0.4		1-3	3
	Slovenia L	SC 500	foliar spray (F)	0.5 - 1 [49]		1-3	3
	Sweden L	WG 50	foliar spray (G)	0.5 - 1 [50]		1-3	3
	Switzerland L	WG 50	foliar spray (G)	0.75	0.075	2-3	3
	Turkey L	SC 500	foliar spray		0.05	> 1[51]	5
	Turkey L	WP 50	foliar spray		0.05	> 1[52]	5
	USA L	WG 50	foliar spray (G)	0.84		1-4	0

[48] No maximum number of applications stated; spray at 10-14 day intervals
[49] Depending on crop height
[50] Rate according to plant height (< 0.5m - >1.25m)
[51] No maximum number of applications stated. ‘Start application when the first symptoms appear’
[52] No maximum number of applications stated. ‘Start application when the first symptoms appear’

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on fenhexamid supervised field trials for

Fruits	Citrus	Table	16	oranges, mandarins, lemons
	Stone	Table	17 - 18	cherries
		Table	19 - 20	peaches and nectarines
		Table	21 - 22	plums
	Berries	Table	23 - 28	grapes
		Table	29 - 33	strawberries
		Table	34	black currants
		Table	35	blueberries
		Table	36	raspberries, blackberries
	Tropical	Table	37	kiwi
Vegetables	Fruiting	Tables	38	cucumber
		Table	39 - 40	tomato
		Table	41	sweet peppers
	Leafy	Table	42 - 43	lettuce
Tree nuts		Table	44	almonds

Trials were well documented with laboratory and field reports. Laboratory reports included method validation including procedural recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates from analyses or duration of residue sample storage were also provided. Although trials included control plots, no control data are recorded in the tables except where residues in control samples exceeded the LOQ. Residue data are recorded unadjusted for recovery.

Results from replicate field plots are presented as individual values. Results from replicate field samples are presented as individual values followed by the mean. Results from replicate laboratory samples are presented as the means. When residues were not detected they are shown as below the LOQ. Residues, application rates and spray concentrations have generally been rounded to two significant figures or, for residues near the LOQ, to one significant figure. Residue values from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels and STMRs. These results are double underlined.

Citrus fruits

Seven field trials (reversed decline studies) were conducted in Japan between 1995 and 1997 with fenhexamid in citrus (orange 2 trials, mandarin 2 trials, lemon 3 trials). Fenhexamid WG 50 was applied twice (orange, lemon) or three times (mandarin) at rates of 0.05 kg ai/hL. The spray interval was 7 – 8 days.

Trials in/on orange and lemon were conducted on two sub-plots each. Fruit samples were taken on days 14, 21 and 28 from sub-plot 1, and on day 41/42 from sub-plot 2. Orange and mandarin fruits were separated into peel and pulp, which were analysed separately. Residues in whole fruit were calculated from data obtained for peel and pulp. For lemon, the whole fruit was analysed.

In the orange and mandarin trials, duplicate samples were taken and analysed at two different laboratories. The residues of fenhexamid were analysed by GC. The analytical method was validated by recovery experiments prior to and during the analysis of the samples by spiking control samples with fenhexamid. The limit of quantification (LOQ) was 0.01 mg/kg.

Table 16. Results of residue trials conducted with fenhexamid in/on citrus fruits in Japan.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Orange Japan 1996	WG 50	2	1.5	0.05	peel	14	4.73	4.6	NR96048 NR96048-A1
						14	4.42		
						21	5.34	5.0	
						21	4.58		
						28	4.38	3.7	
						28	3.08		
					pulp	14	0.02	0.03	
						14	0.04		
						21	0.04	0.05	
						21	0.05		
						28	0.06	0.04	
						28	0.01		
					whole fruit[(a)]	14	1.40	1.4	
						14	1.33		
						21	1.37	1.5	
						21	1.69		
						28	0.99	1.3	
						28	1.66		
	WG 50	2	1.5	0.05	pulp	41	0.02	0.02	NR96048 NR96048-A2
						41	0.02		
					peel	41	1.98	1.8	
						41	1.69		
					whole fruit[(a)]	41	0.55	0.58	reversed decline study
						41	0.61		
Orange Japan 1996	WG 50	2	1.5	0.05	peel	14	2.14	2.2	NR96048 NR96048-B1
						14	2.31		
						21	1.76	1.9	
						21	1.96		
						28	2.18	2.3	
						28	2.36		
					pulp	14	0.04	0.03	
						14	0.02		
						21	0.04	0.04	
						21	0.03		
						28	0.02	0.03	
						28	0.04		
					whole fruit[(a)]	14	0.73	0.76	
						14	0.78		
						21	0.59	0.63	
						21	0.67		
						28	0.69	0.75	
						28	0.81		
	WG 50	2	1.5	0.05	peel	42	2.46	2.04	NR96048 NR96048-B2
						42	1.62		
					pulp	42	0.11	0.08	
						42	0.04		
					whole fruit[(a)]	42	0.84	0.70	reversed decline study
						42	0.56		

Crop Country Year	Application				Residues				Reference
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Study No. Trial Sub ID
Mandarin Japan 1995	WG 50	3	2.0	0.05	peel	14	9.99	10	NR96035 NR96035-A
						14	10.6		
						21	5.57	6.1	
						21	6.54		
						28	8.56	7.8	
						28	7.03		
					pulp	14	0.10	0.11	
						14	0.12		
						21	0.02	0.07	
						21	0.11		
						28	0.04	0.05	
						28	0.06		
					whole fruit[(a)]	14	2.08	2.2	
						14	2.22		
						21	1.13	1.3	
						21	1.40		
						28	1.74	1.6	
						28	1.45		
Mandarin Japan 1995	WG 50	3	2.0	0.05	peel	14	12.3	13	NR96035 NR96035-B
						14	12.6		
						21	11.0	12	
						21	12.4		
						28	9.35	10	
						28	10.6		
					pulp	14	0.10	0.08	
						14	0.05		
						21	0.06	0.07	
						21	0.08		
						28	0.06	0.07	
						28	0.08		
					whole fruit[(a)]	14	2.17	2.2	
						14	2.31		
						21	2.03	2.2	
						21	2.42		
						28	1.92	1.9	
						28	1.87		
Lemon Japan 1996	WG 50	2	1.3	0.05	fruit	14	0.17		NR96047 NR96047-A1
						21	0.08		
						28	0.06		
	WG 50	2	1.3	0.05	fruit	42	0.03		NR96047 NR96047-A2 reversed decline study
Lemon Japan 1996	WG 50	2	1.3	0.05	fruit	14	0.04		NR96047 NR96047-B1
						21	0.06		
						28	0.10		
	WG 50	2	1.3	0.05	fruit	42	< 0.01		NR96047 NR96047-B2 reversed decline study
Lemon Japan 1997	WG 50	2	1.3	0.05	fruit	14	0.91		NR97076 NR97076-A1
						21	0.74		
						28	0.70		

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
	WG 50	2	1.3	0.05	fruit	42	0.02		NR97076 NR97076-A2 reversed decline study

[(a)] calculated values

Stone fruits

Cherries

A total of 28 trials were conducted with fenhexamid applied as pre-harvest foliar sprays and post-harvest treatment to cherries in northern and southern Europe, North America and Asia.

Table 17. Results of residue trials conducted with fenhexamid applied pre-harvest on cherries in Europe and the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Sour cherry Germany 1995	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.57 2.2 1.3 1.0 1.0		RA-2092/95 0578-95
Sour cherry Germany 1995	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.82 3.6 3.5 2.8 2.0		RA-2092/95 0580-95
Sour cherry Germany 1996	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.16 2.6 2.0 1.6 0.22		RA-2030/96 0202-96
Sour cherry Germany 1996	WG 50	3	0.75	0.25	fruit	0* 0 1 3 7	0.17 4.6 2.1 2.1 1.6		RA-2030/96 0203-96
Sweet cherry Germany 1996	WG 50	3	0.75	0.25	fruit	0 1 4	1.5 1.0 0.68		RA-2030/96 0201-96
Sweet cherry France, N 1996	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.58 1.7 1.1 0.82 0.62		RA-2030/96 0453-96
Sweet cherry France, N 1996	WG 50	3	0.75	0.25	fruit	0 1 3 7	3.0 2.1 0.87 0.86		RA-2030/96 0454-96
Sweet cherry Germany 1996	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.18 1.3 0.75 1.2 0.95		RA-2030/96 0200-96

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Sweet cherry Italy 1994	WG 50	4	0.75	0.075	fruit	0* 0 3 7 10	0.47 2.2 1.6 1.8 1.4		RA-2082/94 0529-94
Sweet cherry Italy 1994	WG 50	4	0.75	0.075	fruit	0* 0 3 7 10	0.34 2.1 1.6 1.2 1.2		RA-2082/94 0530-94
Sweet cherry Italy 1995	WG 50	4	0.75	0.075	fruit	0 1 3 7	1.0 0.86 0.91 0.89		RA-2050/95 0048-95
Sweet cherry Italy 1996	WG 50	4	0.75	0.05	fruit	0 1 3 7	0.66 0.63 0.52 0.40		RA-2050/96 0137-96
Sweet cherry MI, USA 1996	WG 50	4	0.84	0.13- 0.14	fruit without stone	0 0	1.40 0.84	1.1	TMN-023X-2 T402-CHE96- 028
Sweet cherry CA, USA 1996	WG 50	4	0.84-0.88	0.06- 0.09	fruit without stone	0 0	1.1 1.1	1.1	TMN-023X-2 T402-CHE96- 029
Sweet cherry OR, USA 1996	WG 50	4	0.84	0.065- 0.068	fruit without stone	0 0	1.8 1.2	1.5	TMN-023X-2 T402-CHE96- 030
Sour cherry NY, USA 1997	WG 50	4	0.84-0.85	0.074- 0.075	fruit without stone	0 0	1.05 1.15	1.1	TMN-023Y T402-CHE97- 201
Sour cherry MI, USA 1997	WG 50	4	0.83-0.84	0.055- 0.063	fruit without stone	0 0	4.95 4.43	4.7	TMN-023Y T402-CHE97- 202
Sour cherry MI, USA 1997	WG 50	4	0.83-0.84	0.082- 0.09	fruit without stone	0 0	2.24 1.55	1.9	TMN-023Y T402-CHE97- 203
Cherry Japan 1998 Indoor	WG 50	2	2.5	0.05	fruit	1 1 3 3 7 7	3.4 3.2 2.0 1.7 1.5 1.1		NR98047 NR98047-A same trial analysed at 2 labs
Cherry Japan 1998 Indoor	WG 50	2	2.0	0.05	fruit	1 1 3 3 7 7	4.0 2.6 5.4 5.1 4.2 2.1		NR98047 NR98047-B same trial analysed at 2 labs

* before last application

Table 18. Results of residue trials conducted with fenhexamid applied post-harvest or pre- and post-harvest on cherries in the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha [1] g ai/100 kg [2]	kg/hL (ai)	Portion analysed	Days [c)]	Fenhexamid (mg/kg) single value	mean value	
Cherry WA, USA 2000	WG 50	1	6.0[b)] [2]		fruit without stone	0 0	2.0 2.9	2.5	IR-4-06937 06937.00-WA33-B
Cherry WA, USA 2000	WG 50	1	6.0[b)] [2]		fruit without stone	0 0	2.9 2.6	2.8	IR-4-06937 06937.00-WA34-B
Cherry MI, USA 2000	WG 50	1	3.0[b)] [2]		fruit without stone	0 0	2.2 2.5	2.4	IR-4-06937 06937.00-MI15-B
Cherry CA, USA 2000	WG 50	1	3.0[b)] [2]		fruit without stone	0 0	1.6 2.2	1.9	IR-4-06937 06937.00-CA52-B
Cherry WA, USA 2000	WG 50	2 1	0.84[a)] [1] 6.0[b)] [2]	0.06	fruit without stone	0 0	2.7 3.6	3.2	IR-4-06937 06937.00-WA33-C
Cherry WA, USA 2000	WG 50	2 1	0.85[a)] [1] 6.0[b)] [2]	0.08	fruit without stone	0 0	2.2 2.4	2.3	IR-4-06937 06937.00-WA34-C
Cherry MI, USA 2000	WG 50	2 1	0.85[a)] [1] 3.0[b)] [2]	0.15	fruit without stone	0 0	3.8 3.6	3.7	IR-4-06937 06937.00-MI15-C
Cherry CA, USA 2000	WG 50	2 1	0.87[a)] [1] 3.0[b)] [2]	0.09	fruit without stone	0 0	2.4 2.2	2.3	IR-4-06937 06937.00-CA52-C

[a)] pre-harvest application
[b)] post-harvest application
[c)] days after last application

Stone fruits

Peaches and nectarines

A total of 31 trials were conducted with fenhexamid as either a foliar spray or post-harvest treatment on peach and nectarine in southern Europe, North America and Asia.

Table 19. Results of residue trials conducted with fenhexamid applied pre-harvest on peaches and nectarines in Europe and the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Peach Spain 1994	WG 50	4	0.75	0.063-0.075	fruit without stone	0* 0 3 7 10	0.41 0.88 0.66 0.64 0.27		RA-2116/94 0522-94
					whole fruit[(a)]	3 7 10	0.63 0.61 0.26		
Peach Spain 1994	WG 50	4	0.75	0.075-0.11	fruit without stone	0* 0 3 7 10	0.30 0.79 0.82 0.66 0.49		RA-2116/94 0524-94

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
					whole fruit[(a)]	0* 0 3 7 10	0.29 0.74 0.77 0.62 0.47		
Peach Italy 1994	WG 50	4	0.75	0.06	fruit without stone	0* 0 3 7 10	0.11 0.70 0.22 0.09 0.05		RA-2116/94 0531-94
					whole fruit[(a)]	0* 0 3 7 10	0.10 0.63 0.20 0.08 < 0.05		
Peach Italy 1994	WG 50	4	0.75	0.06	fruit fruit without stone	0* 0 3 7	0.18 0.37 0.24 0.36		RA-2116/94 0532-94
					whole fruit[(a)]	7	0.29		
Nectarine Italy 1995	WG 50	4	0.75	0.05	fruit without stone	0 1 3 7	0.62 0.39 0.30 0.31		RA-2046/95 0074-95
					whole fruit[(a)]	0 1 3 7	0.57 0.36 0.28 0.29		
Nectarine Italy 1995	WG 50	4	0.75	0.05	fruit without stone whole fruit[(a)]	0 1 3 7 0 1 3 7	0.37 0.22 0.20 0.16 0.30 0.18 0.17 0.14		RA-2046/95 0505-95
Peach Spain 1995	WG 50	4	0.75	0.05-0.057	fruit	0 1 3 7	0.61 0.36 0.29 0.31		RA-2046/95 0075-95
Peach Spain 1995	WG 50	4	0.75	0.05-0.057	fruit	0 1 4 7	0.55 0.44 0.35 0.34		RA-2046/95 0501-95
Peach PA, USA 1996	WG 50	4	0.83- 0.85	0.096-0.099	fruit without stone	0 0	1.3 1.5	1.4	TMN-023X-2 T402-PEA96- 021
Peach NC, USA 1996	WG 50	4	0.84- 0.85	0.089-0.090	fruit without stone	0 0	0.95 0.33	0.66	TMN-023X-2 T402-PEA96- 022
Peach CA, USA 1996	WG 50	4	0.83- 0.86	0.06-0.09	fruit without stone	0 0	0.68 0.70	0.69	TMN-023X-2 T402-PEA96- 023
Peach CA, USA 1996	WG 50	4	0.82- 0.86	0.06-0.09	fruit without stone	0 0	0.55 0.69	0.62	TMN-023X-2 T402-PEA96- 024
Peach NC, USA 1997	WG 50	4	0.85- 0.88	0.044-0.048	fruit without stone	0 0	2.0 2.13	2.1	TMN-023Y T402-PEA97- 204

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Peach SC, USA 1997	WG 50	4	0.83-0.84	0.044-0.090	fruit without stone	0 0	1.08 1.46	1.3	TMN-023Y T402-PEA97-205
Peach MI, USA 1997	WG 50	4	0.84	0.06-0.088	fruit without stone	0 0	1.37 1.21	1.3	TMN-023Y T402-PEA97-206
Peach TX, USA 1997	WG 50	4	0.84-0.86	0.058-0.060	fruit without stone	0 0	1.76 1.98	1.9	TMN-023Y T402-PEA97-207
Peach CA, USA 1997	WG 50	4	0.83-0.86	0.04-0.06	fruit without stone	0 0	1.19 1.12	1.2	TMN-023Y T402-PEA97-208
Peach Japan 1996	WG 50	2	1.5	0.05	pulp	1 1 3 3 7 7	0.03 0.11 0.04 0.12 0.06 0.21		NR96044 NR96044-A1 samples analysed in 2 different labs
						14 14	0.14 0.04		NR96044-A2 reversed decline study
Peach Japan 1996	WG 50	2	1.5	0.05	pulp	1 1 3 3 7 7	0.07 0.10 0.03 0.06 0.04 0.06		NR96044 NR96044-B1 samples analysed in 2 different labs
						14 14	< 0.01 < 0.01		NR96044-B2 reversed decline study

* before last application (a) calculated values

Table 20. Results of residue trials conducted with fenhexamid applied post-harvest or pre- and post-harvest on peaches in the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha [1] g ai/100 kg [2]	kg ai/hL	Portion analysed	Days[(e)]	Fenhexamid (mg/kg) single value	mean value	
Peach NJ, USA 2000	WG 50	1	[2]	0.09[(a)]	fruit without stone	0 0	5.2 6.6	5.9	IR-4-06936 06936.00-NJ32-B
Peach NJ, USA 2000	WG 50	2 1	0.87[(b)] [1] [2]	0.121 0.09[(a)]	fruit without stone	0 0	4.1 7.2	5.7	IR-4-06936 06936.00-NJ32-C
Peach NC, USA 2000	WG 50	1	0.37[(c)] [2]		fruit without stone	0 0	0.52 0.78	0.65	IR-4-06936 06936.00-NC22-B
Peach NC, USA 2000	WG 50	2 1	0.84[(b)] [1] 0.37[(c)] [2]	0.105	fruit without stone	0 0	0.58 0.68	0.63	IR-4-06936 06936.00-NC22-C
Peach NC, USA 2000	WG 50	1	[2]	0.09[(a)]	fruit without stone	0 0	4.3 3.8	4.1	IR-4-06936 06936.00-NC22-D
Peach NC, USA 2000	WG 50	2 1	0.84[(b)] [1] [2]	0.105 0.09[(a)]	fruit without stone	0 0	4.8 4.8	4.8	IR-4-06936 06936.00-NC22-E
Peach CA, USA 2000	WG 50	1	0.38[(c)] [2]		fruit without stone	0 0	1.7 1.4	1.6	IR-4-06936 06936.00-CA53-B

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha [1] g ai/100 kg [2]	kg ai/hL	Portion analysed	Days[e]	Fenhexamid (mg/kg) single value	mean value	
Peach CA, USA 2000	WG 50	2 1	0.83[b] [1] 0.37[c] [2]	0.09	fruit without stone	0 0	2.6 3.0	2.8	IR-4-06936 06936.00- CA53-C
Peach CA, USA 2000	WG 50	1	0.39[d] [2]		fruit without stone	0 0	1.5 4.2	2.9	IR-4-06936 06936.00- CA53-D
Peach CA, USA 2000	WG 50	2 1	0.83[b] [1] 0.39[d] [2]	0.09	fruit without stone	0 0	4.4 3.2	3.8	IR-4-06936 06936.00- CA53-E
Peach CA, USA 2000	WG 50	1	[2]	0.09[a]	fruit without stone	0 0	5.6 3.5	4.6	IR-4-06936 06936.00- CA53-F
Peach CA, USA 2000	WG 50	2 1	0.83[b] [1] [2]	 0.09[a]	fruit without stone	0 0	4.6 3.1	3.9	IR-4-06936 06936.00- CA53-G

[a] post-harvest application (dip)
[b] pre-harvest application
[c] post-harvest application (high-volume spray)
[d] post-harvest application (ultra low-volume spray)
[e] days after last application

Stone fruits

Plums

A total of 30 trials were conducted with fenhexamid as pre-harvest foliar sprays and post-harvest treatment on plums in northern and southern Europe and North America.

Table 21. Results of residue trials conducted with fenhexamid applied pre-harvest on plums in Europe and the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Plum Germany 1995	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.09 < 0.05 0.07 0.07 0.08		RA-2092/95 0576-95
Plum UK 1995	WG 50	3	0.75	0.05	fruit without stone	0* 0 1 3 7	0.22 0.71 0.66 0.42 0.28		RA-2092/95 0577-95
					whole fruit(a)	0* 0 1 3 7	0.20 0.65 0.60 0.39 0.25		
Plum France-North 1996	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.19 0.34 0.39 0.37 0.24		RA-2036/96 0465-96
Plum UK 1996	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.07 0.18 0.15 0.14 0.08		RA-2036/96 0466-96

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Plum The Nether-lands 1996	WG 50	3	0.75	0.25	fruit	0* 0 1 3 7	0.48 0.78 0.67 0.66 0.39		RA-2036/96 0467-96
Plum Germany 1996	WG 50	3	0.9	0.25	fruit	0* 0 1 3 7	0.25 0.53 0.44 0.31 0.27		RA-2036/96 0468-96
Plum Germany 1996	WG 50	3	0.75	0.25	fruit	0* 0 1 3 7	0.15 2.20 0.86 0.62 0.79		RA-2036/96 0797-96
Plum Germany 1996	WG 50	3	0.75	0.25	fruit	0* 0 1 3 7	0.16 0.43 0.35 0.31 0.24		RA-2036/96 0798-96
Plum Italy 1994	WG 50	4	0.75	0.05	fruit	0* 0 3 7	0.20 0.64 0.20 0.09		RA-2082/94 0533-94
Plum Italy 1994	WG 50	4	0.75	0.05	fruit without stone	0* 0 3 7 10	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05		RA-2082/94 0541-94
					whole fruit(a)	0* 0 3 7 10	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05		
Plum France-South 1995	WG 50	4	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.18 0.14 0.11 0.10		RA-2048/95 0438-95
Plum France-South 1995	WG 50	4	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.22 0.23 0.37 0.20		RA-2048/95 0504-95
Plum Italy 1995	WG 50	4	0.75	0.05	fruit	0* 0 1	< 0.05 0.05 < 0.05		RA-2048/95 0051-95
					fruit without stone	3 7	< 0.05 < 0.05		
					whole fruit(a)	3 7	< 0.05 < 0.05		
Plum CA, USA 1996	WG 50	4	0.84-0.86	0.06-0.09	fruit without stone	0 0	< 0.05 < 0.05	< 0.05	TMN-023X-2 T402-PLU96-025
Plum CA, USA 1996	WG 50	4	0.83-0.85	0.06-0.09	fruit without stone	0 0	0.06 < 0.05	0.06	TMN-023X-2 T402-PLU96-026
Plum OR, USA 1996	WG 50	4	0.83-0.84	0.05-0.07	fruit without stone	0 0	0.13 0.16	0.15	TMN-023X-2 T402-PLU96-027

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Plum MI, USA 1997	WG 50	4	0.83-0.84	0.07-0.09	fruit without stone	0 0	0.37 0.16	0.27	TMN-023Y T402-PLU97-209
Plum CA, USA 1997	WG 50	4	0.84-0.85	0.035-0.06	fruit without stone	0 0	< 0.05 0.06	0.06	TMN-023Y T402-PLU97-210
Plum CA, USA 1997	WG 50	4	0.84-0.85	0.03-0.07	fruit without stone	0 0	0.06 0.06	0.06	TMN-023Y T402-PLU97-211
Plum MI, USA 2001	WG 50	4	0.84	0.13-0.14	fruit without stone	0 0	0.32 0.33	0.33	TCI-01-008 TCI-01-008-01
Plum ID, USA 2001	WG 50	4	0.83-0.85	0.07	fruit without stone	0 0	0.07 < 0.05	0.06	TCI-01-008 TCI-01-008-02

* before last application
(a) calculated values

Table 22. Results of residue trials conducted with fenhexamid applied post-harvest or pre- and post-harvest on plums in the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha [1] g ai/100 kg [2]	kg ai/hL	Portion analysed	Days[e]	Fenhexamid (mg/kg) single value	mean value	
Plum CA, USA 2000	WG 50	1	0.36[a] [2]		fruit without stone	0 0	0.24 0.21	0.23	IR-4-07318 07318.00-CA54-B
Plum CA, USA 2000	WG 50	2 1	0.84[b] [1] 0.36[a] [2]	0.09	fruit without stone	0 0	0.40 0.26	0.33	IR-4-07318 07318.00-CA54-C
Plum CA, USA 2000	WG 50	1		0.09[c]	fruit without stone	0 0	0.71 0.58	0.65	IR-4-07318 07318.00-CA54-D
Plum CA, USA 2000	WG 50	2 1	0.85[b] [1]	0.09 0.09[c]	fruit without stone	0 0	0.66 0.54	0.60	IR-4-07318 07318.00-CA54-E
Plum CA, USA 2000	WG 50	1	0.38[d] [2]		fruit without stone	0 0	0.42 0.34	0.38	IR-4-07318 07318.00-CA55-B
Plum CA, USA 2000	WG 50	2 1	0.84[b] [1] 0.36[d] [2]	0.09	fruit without stone	0 0	0.30 0.40	0.35	IR-4-07318 07318.00-CA55-C
Plum CA, USA 2000	WG 50	1		0.09[c]	fruit without stone	0 0	0.34 0.33	0.34	IR-4-07318 07318.00-CA55-D
Plum CA, USA 2000	WG 50	2 1	0.84[b] [1]	0.09 0.09[c]	fruit without stone	0 0	0.36 0.38	0.37	IR-4-07318 07318.00-CA55-E

(a) post-harvest application (high-volume spray)
(b) pre-harvest application
(c) post-harvest application (dip)
(d) post-harvest application (ultra low-volume spray)
(e) days after last application

Berries and other small fruits

Grapes

A total of 72 trials were conducted with fenhexamid on grapes in Australia, Africa, North America, and northern and southern Europe.

Table 23. Results of residue trials conducted with fenhexamid applied on grapes in Europe (outdoor).

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Grape Germany 1995	WG 50	2	0.66-0.80	0.05	bunch of grapes	0	1.9		RA-2056/95 0144-95 *white variety*
						8	1.7		
						14	1.1		
						21	0.95	0.90	
						21	0.84		
						28	1.4		
Grape Germany 1995	WG 50	2	0.73-0.84	0.16	bunch of grapes	0	1.5		RA-2056/95 0146-95 *white variety*
						7	0.82		
						14	0.83		
						21	0.65		
						21	0.73	0.69	
						28	0.66		
Grape Germany 1995	WG 50	2	0.70-0.80	0.05	bunch of grapes	0	1.6		RA-2056/95 0522-95 *red variety*
						8	1.3		
						14	0.94		
						21	1.0		
						21	0.69	0.85	
						28	0.80		
Grape Germany 1995	WG 50	2	0.73-0.84	0.16	bunch of grapes	0	1.4		RA-2056/95 0523-95 *red variety*
						7	1.2		
						14	0.99		
						21	0.81		
						21	0.88	0.85	
						28	0.69		
Grape Germany 1998	WG 50	2	0.75	0.05	bunch of grapes	0	0.82		RA-2182/98 1711-98 *red variety*
						14	0.38		
						21	0.30		
					berry	21	0.27		
Grape Germany 1998	WG 50	2	0.75	0.05	bunch of grapes	0	0.61		RA-2182/98 1712-98 *white variety*
						14	0.40		
						21	0.48		
					berry	21	0.35		
Grape France-North 1998	WG 50	2	0.75	0.50	bunch of grapes	0	1.4		RA-2182/98 1713-98 *red variety*
						14	0.96		
						21	0.75		
					berry	21	0.47		
Grape Germany 1998	WG 50	2	0.75	0.14-0.16	bunch of grapes	0	0.79		RA-2182/98 1714-98 *white variety*
						14	0.38		
						21	0.38		
					berry	21	0.25		
Grape France-North 1998	SC 500	2	0.75	0.50	bunch of grapes	0	0.79		RA-2011/98 1032-98 *red variety*
						14	0.65		
						21	0.51		
					berry	21	0.35		
Grape Germany 1998	SC 500	2	0.70-0.80	0.05	bunch of grapes	0	0.92		RA-2011/98 1033-98 *white variety*
						14	0.44		
						21	0.47		
					berry	21	0.44		

Crop Country Year	Application FL	No.	kg ai/ha	kg ai/hL	Residues Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Reference Study No. Trial Sub ID
Grape	WG 50	3	0.50	0.50	bunch of grapes	0*	0.47		RA-2045/94
France-						0	1.3		0185-94
South						7	1.2		*red variety*
1994						14	0.95		
						21	1.1		
						28	0.41		
Grape	WG 50	3	0.50	0.50	bunch of grapes	0*	0.49		RA-2045/94
France-						0	1.2		0186-94
South						7	0.88		*white variety*
1994						14	0.83		
						21	0.35		
						28	0.26		
Grape	WG 50	3	0.50	0.06-	bunch of grapes	0*	1.2		RA-2045/94
Spain				0.11		0	2.6		0187-94
1994						7	2.0		*white variety*
						14	0.91		
						21	0.97		
						28	0.43		
Grape	WG 50	3	0.50	0.06-	bunch of grapes	0*	1.5		RA-2045/94
Spain				0.11		0	2.3		0188-94
1994						7	1.8		*white variety*
						13	1.4		
						21	1.3		
						28	0.81		
Grape	WG 50	3	0.50	0.06-	bunch of grapes	0	1.4		RA-2057/95
Spain				0.11		8	0.37		0087-95
1995						14	0.20		*white variety*
						21	0.10		
						21	0.14	0.12	
						27	0.10		
Grape	WG 50	3	0.54-	0.05	bunch of grapes	0	1.4		RA-2057/95
Portugal			0.62			7	0.69		0088-95
1995						7	2.0	1.3	*white variety*
						14	0.73		
						21	0.80		
						21	0.75	0.78	
						28	0.50		
					berry	7	0.46		
						7	0.56	0.51	
Grape	WG 50	3	0.50	0.05	bunch of grapes	0	1.5		RA-2057/95
Italy						7	0.93		0524-95
1995						7	0.92	0.93	*red variety*
						14	0.81		
						21	0.87		
						21	0.81	0.84	
						28	0.55		
					berry	7	0.96		
						7	0.53	0.75	
Grape	WG 50	3	0.50	0.06-	bunch of grapes	0	0.77		RA-2057/95
Spain				0.11		7	0.37		0526-95
1995						15	0.23		*red variety*
						21	0.14		
						21	0.12	0.13	
						28	0.16		
Grape	WG 50	2	0.75	0.094-	bunch of grapes	0	2.0		RA-2057/95
Spain				0.13		8	0.75		0142-95
1995						14	0.48		*white variety*
						21	0.23		
						21	0.31	0.27	
						27	0.17		

Crop Country Year	Application FL	No.	kg ai/ha	kg ai/hL	Residues Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Reference Study No. Trial Sub ID
Grape Portugal 1995	WG 50	2	0.75-0.81	0.075	bunch of grapes	0	3.4		RA-2057/95 0143-95 *white variety*
						7	1.8		
						14	1.3		
						21	0.94		
						21	1.6	1.3	
						28	0.58		
Grape Italy 1995	WG 50	2	0.75	0.075	bunch of grapes	0	2.7		RA-2057/95 0525-95 *red variety*
						7	1.9		
						14	1.5		
						21	1.8		
						21	1.9	1.9	
						28	1.7		
Grape Spain 1995	WG 50	2	0.75	0.09-0.13	bunch of grapes	0	0.92		RA-2057/95 0527-95 *red variety*
						7	0.95		
						15	0.75		
						21	0.32		
						21	0.34	0.33	
						28	0.19		
Grape France, S 1998	WG 50	2	0.75	0.75	bunch of grapes	0	0.59		RA-2183/98 1715-98 *red variety*
						7	0.66		
						14	0.25		
						21	0.20		
					berry	7	0.37		
						21	0.20		
Grape Italy 1998	WG 50	2	0.75	0.075-0.13	bunch of grapes	0	1.6		RA-2183/98 1716-98 *white variety*
						7	0.87		
						14	0.65		
						21	0.44		
					berry	7	0.96		
						21	0.58		
Grape Spain 1998	WG 50	2	0.75-0.83	0.075-0.13	bunch of grapes	0	0.71		RA-2183/98 1717-98 *white variety*
						7	0.49		
						14	0.29		
						21	0.20		
					berry	7	0.39		
						21	0.18		
Grape Portugal 1998	WG 50	2	0.75	0.075	bunch of grapes	0	2.2		RA-2183/98 1719-98 *red variety*
						7	1.5		
						14	1.2		
						21	0.75		
					berry	7	1.4		
						21	0.57		
Grape France, S 1998	SC 500	2	0.75	0.75	bunch of grapes	0	0.25		RA-2012/98 1034-98 *red variety*
						7	0.47		
						14	0.30		
						21	0.29		
					berry	7	0.45		
						14	0.42		
Grape Italy 1998	SC 500	2	0.75	0.075-0.13	bunch of grapes	0	1.7		RA-2012/98 1035-98 *white variety*
						7	1.1		
						14	0.52		
						21	0.50		
					berry	7	0.78		
						14	0.62		
Table grape France-South 2000	WG 50	2	0.7-0.88	0.075	bunch of grapes	0*	0.44		RA-2022/00 0190-00 *white variety*
						0	2.0		
						3	1.6		
						7	1.7		
						14	1.5		
					berry	7	1.6		

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Table grape France-South 2000	WG 50	2	0.75	0.075	bunch of grapes	0* 0 3 7 14	0.19 0.34 0.43 0.33 0.40		RA-2022/00 0191-00 *red variety*
					berry	7	0.47		
Table grape France-South 2000	WG 50	2	0.75	0.075	bunch of grapes	0* 0 3 7 14	0.17 1.3 0.72 1.0 0.94		RA-2022/00 0192-00 *white variety*
					berry	7	1.1		

* before last application

Table 24. Results of residue trials conducted with fenhexamid applied to grapes in North America (outdoor).

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Grape NY, USA 1995	WG 50	3	0.56-0.59	0.06-	bunch of grapes	0	0.97		TMN-021L-1 T402-95-01A-A *red variety*
Grape CA, USA 1995	WG 50	3	0.55-0.59	0.06	bunch of grapes	0 3 7 14	0.65 0.78 0.70 0.41		TMN-021L-1 T402-95-01B-A *white variety*
Grape CA, USA 1995	WG 50	3	0.56	0.06	bunch of grapes	0	2.2		TMN-021L-1 T402-95-01C-A *white variety*
Grape PA, USA 1996	WG 50	3	0.56	0.07	bunch of grapes	0	0.55		TMN-021L-1 T402-GRA96-001 *red variety*
Grape NY, USA 1996	WG 50	3	0.56-0.57	0.06	bunch of grapes	0	0.91		TMN-021L-1 T402-GRA96-002 *white variety*
Grape CA, USA 1996	WG 50	3	0.56	0.04	bunch of grapes	0	1.0		TMN-021L-1 T402-GRA96-003 *red variety*
Grape CA, USA 1996	WG 50	3	0.56	0.04	bunch of grapes	0	2.8		TMN-021L-1 T402-GRA96-004 *white variety*
Grape CA, USA 1996	WG 50	3	0.56	0.04	bunch of grapes	0	1.1		TMN-021L-1 T402-GRA96-005 *red variety*
Grape CA, USA 1996	WG 50	3	0.56-0.57	0.02-0.03	bunch of grapes	0	1.1		TMN-021L-1 T402-GRA96-006 *red variety*
Grape CA, USA 1996	WG 50	3	0.56-0.57	0.02-0.06	bunch of grapes	0	1.9		TMN-021L-1 T402-GRA96-007 *white variety*
Grape CA, USA 1996	WG 50	3	0.56-0.57	0.02	bunch of grapes	0	0.87		TMN-021L-1 T402-GRA96-008 *red variety*
Grape CA, USA 1996	WG 50	3	0.56-0.57	0.02	bunch of grapes	0	0.71		TMN-021L-1 T402-GRA96-009 *white variety*
Grape WA, USA 1996	WG 50	3	0.56-0.65	0.06	bunch of grapes	0	1.6		TMN-021L-1 T402-GRA96-010 *white variety*

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Grape WA, USA 1996	WG 50	3	0.56	0.05-0.06	bunch of grapes	0	1.1		TMN-021L-1 T402-GRA96-011 *red variety*
Grape ID, USA 1996	WG 50	3	0.56-0.57	0.06	bunch of grapes	0	1.6		TMN-021L-1 T402-GRA96-012 *red variety*
Grape Ontario Canada 1996	WG 50	3	0.55	0.04	bunch of grapes	0* 0	0.33 1.4		TMN-021Q T402-GRA96-074A *white variety*
Grape Ontario Canada 1996	WG 50	3	0.55	0.04	bunch of grapes	0* 0	0.14 1.2		TMN-021Q T402-GRA96-075A *white variety*
Grape WA, USA 1997	WG 50	3	0.56	0.03-0.06	bunch of grapes	0 0	0.62 0.61	0.62	TMN-021R-1 T402-GRA97-217 *red variety*
Grape Ontario Canada 1999	WG 50	3	0.56	0.06	bunch of grapes	0 0	1.41 1.27	1.3	99TOM03 T402-CANGRA99-005R *white variety*
Grape Ontario Canada 1999	WG 50	3	0.55-0.57	0.06	bunch of grapes	0 0	1.13 1.26	1.2	99TOM03 T402-CANGRA99-006R *SW 23512*
Grape Ontario Canada 1999	WG 50	3	0.55-0.57	0.06	bunch of grapes	0 0	2.14 1.47	1.8	99TOM03 T402-CANGRA99-007R *white variety*
Grape Ontario Canada 1999	WG 50	3	0.54-0.56	0.06	bunch of grapes	0 0 2 2 4 4 6 6 8 8 10 10 14 14	2.1 2.1 1.6 1.8 1.5 1.8 1.7 1.3 1.4 1.2 0.87 0.61 0.99 0.53	2.1	99TOM03 T402-CANGRA99-008R *red variety*

* before last application

Table 25. Results of residue trials conducted with fenhexamid applied to grapes in South Africa (outdoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Grape South Africa 1997	WG 50	5	0.38	0.038	bunch of grapes	0* 0 1 3 7	0.97 1.9 1.6 2.0 1.7	311/R74 311-R74-A *white variety*
						0* 0 1 3 7	0.61 1.1 2.0 2.4 0.92	311/R74 311-R74-B *white variety* 2 replicate plots

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Table grape South Africa 1998	SC 500 DP 92[(a)]	2 2	0.28-0.38 0.28	0.038	bunch of grapes	0* 0 3 7	0.23 0.61 0.52 0.42	5438/1295681/S221 1295681-S221-C *red variety*
Table grape South Africa 1998	SC 500 DP 92[(a)]	2 2	0.28-0.38 0.56	0.038	bunch of grapes	0* 0 3 7	0.65 1.0 1.1 0.85	5438/1295681/S221 1295681-S221-D *red variety*
Table grape South Africa 1998	SC 500 DP 92[(a)]	2 2	0.28-0.38 0.28	0.038	bunch of grapes	0* 0 3 7	1.1 1.2 0.51 0.54	5438/1295699/S222 1295699-S222-C *white variety*
Table grape South Africa 1998	SC 500 DP 92[(a)]	2 2	0.28-0.38 0.56	0.038	bunch of grapes	0* 0 3 7	1.1 1.4 1.3 0.83	5438/1295699/S222 1295699-S222-D *white variety*

* before last application
[(a)] DP 92 contains 1.875% fenhexamid and 90% sulphur

Table 26. Results of residue trials conducted with fenhexamid applied on grapes in Japan (outdoor).

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Grape Japan 1996	WG 50	2	1.5	0.05	fruit	14 14 21 21 28 28 42 42	0.42 0.44 0.32 0.30 0.94 1.46 7.77 4.76	 0.43 0.31 1.2 <u>6.3</u>	96045 JAP-96045-A1/A2/A3 *red variety* reversed decline study
Grape Japan 1996	WG 50	2	1.5	0.05	fruit	14 14 21 21 28 28 42 42	4.32 4.2 3.32 4.42 1.32 1.2 1.88 2.04	 <u>4.3</u> 3.9 1.3 2.0	96045 JAP-96045-B1/B2/B3 *red variety* reversed decline study
Grape Japan 1996	WG 50	2	1.5	0.05	fruit	14 14 21 21 28 28 42 42	6.96 6.38 5.99 4.86 6.38 5.64 7.48 5.29	 <u>6.7</u> 5.4 6.0 6.4	96046 JAP-96046-A1/A2/A3 *white variety* reversed decline study
Grape Japan 1996	WG 50	2	1.5	0.05	fruit	14 14 21 21 28 28 42 42	11.0 11.6 6.64 9.92 9.36 9.92 8.44 10.4	 <u>11</u> 8.3 9.6 9.4	96046 JAP-96046-B1/B2/B3 *white variety* reversed decline study

Table 27. Results of residue trials conducted with fenhexamid applied on grapes in Japan (indoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Grape Japan 1997 reversed decline study	50 WP	2	1.5	0.05	fruit	14 21 28 42	0.13 0.14 0.08 0.08	97053 JAP-97053-A1/A2/A3 *red variety*
Grape Japan 1997 reversed decline study	50 WP	2	1.5	0.05	fruit	14 21 28 42	3.1 3.2 1.4 0.03	97053 JAP-97053-B1/B2/B3 *red variety*

Table 28. Results of residue trials conducted with fenhexamid applied on grapes in Australia.

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Grape Australia 1999	SC 500	2	0.66-0.72	0.05	bunch of grapes	0 7 15 21 28 35	7.9 5.5 1.0 1.3 0.94 1.1	SCM 316/00 AUS-SCM316-00-A *white variety*
Grape Australia 1999	SC 500	2	1.0-2.0	0.05	bunch of grapes	0 14 21 28 35	2.5 2.5 1.9 1.5 1.2	PJH 316/00 AUS-PJH316-00-A *white variety*
Table grape Australia 1999	SC 500	2	1.5	0.05	berry	0 14 21 28 35	12.1 3.7 2.4 2.5 1.5	MWS 450/00 AUS-MWS450-00-A *red variety*
Grape Australia 1999	SC 500	2	1.95	0.05	berry	0 14 21 28 35	10 1.8 3.5 1.3 1.3	DJR 191/00 AUS-DJR191-00-A *red variety*
Grape Australia 1999	SC 500	2	1.0-2.0	0.05	berry	0 14 21 28 35	2.9 2.0 1.3 1.5 1.3	PJH 315/00 AUS-PJH315-00-A *white variety*
Grape Australia 1999	SC 500	2	2.1	0.05	berry	0 14 21 28 35	5.7 4.8 3.8 4.7 3.0	RTL 539/00 AUS-RTL539-00-A *white variety*
Grape Australia 2000	SC 500	2	2.6	0.05	berry	0 14 21 28 35	8.5 4.8 4.9 6.1 5.4	DJR 192/00 AUS-DJR192-00-A *white variety*

Berries and other small fruit

Strawberries

A total of 49 trials were conducted with fenhexamid in/on strawberries in northern and southern Europe, North America, Asia and Australia.

Table 29. Results of residue trials conducted with fenhexamid applied on strawberries in Europe (outdoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Strawberry UK 1994	WG 50	3	1.0	0.20	fruit	0* 0 1 3 5 7	0.10 0.72 0.81 0.70 0.53 0.49	RA-2042/94 0174-94
Strawberry UK 1994	WG 50	3	1.0	0.20	fruit	0* 0 1 3 5 7	0.31 1.4 1.5 0.78 0.78 0.48	RA-2042/94 0175-94
Strawberry Germany 1994	WG 50	3	1.0	0.05	fruit	0* 0 1 3 5 7 14	0.09 2.4 1.5 1.2 1.0 0.63 0.31	RA-2042/94 0464-94
Strawberry Germany 1994	WG 50	3	1.0	0.05	fruit	0* 0 1 3 5 7 14	0.26 1.5 1.3 1.9 0.92 0.53 0.06	RA-2042/94 0466-94
Strawberry Germany 1995	WG 50	3	1.0	0.05	fruit	0 1 3 5 7	1.9 1.3 1.1 0.75 0.76	RA-2052/95 0032-95
Strawberry France-North 1995	WG 50	3	1.0	0.10	fruit	0 1 3 5 7	0.85 0.71 0.54 0.57 0.49	RA-2052/95 0043-95
Strawberry Germany 1995	WG 50	3	1.0	0.05	fruit	0 1 3 5 7	4.1 1.9 1.2 1.0 0.46	RA-2052/95 0509-95
Strawberry France-North 1995	WG 50	3	1.0	0.10	fruit	0 1 3 5 7	1.2 0.96 0.81 0.76 0.65	RA-2052/95 0510-95
Strawberry Germany 1998	SC 500	3	1.0	0.05	fruit	0 1	0.58 0.50	RA-2010/98 1015-98

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Strawberry UK 1998	SC 500	3	1.0	0.05	fruit	0* 0 1	0.06 0.54 0.29	RA-2010/98 1099-98
Strawberry Spain 1994	WG 50	5	0.50-0.75	0.075	fruit	0* 0 1 3 7	0.17 0.92 1.1 0.56 0.38	RA-2117/94 0520-94
Strawberry Spain 1994	WG 50	5	0.75	0.075	fruit	0* 0 1 3 7	0.25 0.88 1.1 0.62 0.45	RA-2117/94 0521-94
Strawberry Italy 1994	WG 50	5	0.75	0.075	fruit	0* 0 1 3 7	< 0.05 0.58 0.48 0.25 0.11	RA-2117/94 0525-94
Strawberry Italy 1994	WG 50	5	0.75	0.075	fruit	0* 0 1 3 7	0.13 0.67 0.74 0.29 < 0.05	RA-2117/94 0526-94
Strawberry Italy 1995	WG 50	4	0.75	0.075	fruit	0 1 3 7	0.59 0.66 0.31 0.32	RA-2053/95 0037-95
Strawberry France-South 1995	WG 50	4	0.75	0.075	fruit	0 1 3 7	1.3 1.5 0.57 0.05	RA-2053/95 0511-95
Strawberry Italy 1995	WG 50	4	0.75	0.075	fruit	0 1 3 7	0.92 1.0 0.87 0.38	RA-2053/95 0512-95
Strawberry France-South 1996	WG 50	4	0.75	0.075	fruit	0 1 3 7	1.8 1.3 0.97 0.48	RA-2037/96 0717-96

* before last application

Table 30. Results of residue trials conducted with fenhexamid applied on strawberries in Europe (indoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Strawberry Spain 1995	WG 50	4	0.75	0.09	fruit	0* 0 1 3 7	0.66 0.75 0.62 0.55 0.71	RA-2054/95 0034-95
Strawberry Spain 1995	WG 50	4	0.75	0.09	fruit	0* 0 1 3 7	0.83 1.2 1.3 1.7 0.95	RA-2054/95 0513-95

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Strawberry Spain 1995	WG 50	4	0.75	0.09	fruit	0* 0 1 3 7	0.66 0.84 0.67 0.81 0.65	RA-2054/95 0514-95
Strawberry Spain 1995	WG 50	4	0.75	0.09	fruit	0* 0 1 3 7	0.70 1.3 1.1 1.0 0.73	RA-2054/95 0515-95
Strawberry Spain 1996	WG 50	3	1.0	0.10	fruit	0 1 3 7	1.8 1.8 1.4 1.0	RA-2033/96 0045-96
Strawberry Spain 1996	WG 50	3	1.0-1.1	0.10	fruit	0 1 3 7	1.4 1.0 0.96 0.88	RA-2033/96 0457-96
Strawberry France, S 1996	WG 50	3	1.0	0.13	fruit	0 1 3 7	0.71 0.36 0.59 0.44	RA-2033/96 0458-96
Strawberry Italy 1996	WG 50	3	1.0	0.10	fruit	0 1 3 7	2.3 2.1 2.0 1.1	RA-2033/96 0459-96

* before last application

Table 31. Results of residue trials conducted with fenhexamid applied on strawberries in North America (outdoor).

Crop	Application				Residues				Reference
Country Year	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Study No. Trial Sub ID
Strawberry CA, USA 1995	WG 50	4	0.89-0.99	0.17	fruit	0 3 7 14	1.1 0.71 0.67 0.39		TMN-024E-1 T402-95-02B-A
Strawberry CA, USA 1995	WG 50	4	0.97-1.0	0.17	fruit	0	1.2		TMN-024E-1 T402-95-02C-A
Strawberry NY, USA 1996	WG 50	4	0.83-0.87	0.18	fruit	0	2.0		TMN-024E-1 T402-STR96-013
Strawberry FL, USA 1996	WG 50	4	0.84-0.85	0.45	fruit	0	2.3		TMN-024E-1 T402-STR96-014
Strawberry FL, USA 1996	WG 50	4	0.85-0.88	0.46	fruit	0	0.67		TMN-024E-1 T402-STR96-015
Strawberry NC, USA 1996	WG 50	4	0.82-0.84	0.34-0.37	fruit	0	0.35		TMN-024E-1 T402-STR96-016
Strawberry MI, USA 1996	WG 50	4	0.83-0.84	0.36-0.40	fruit	0	0.42		TMN-024E-1 T402-STR96-017

Crop Country Year	Application FL	No.	kg ai/ha	kg ai/hL	Residues Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Reference Study No. Trial Sub ID
Strawberry CA, USA 1996	WG 50	4	0.84-0.85	0.09	fruit	0	0.97		TMN-024E-1 T402-STR96-018
Strawberry CA, USA 1996	WG 50	4	0.84-0.86	0.09	fruit	0	2.1		TMN-024E-1 T402-STR96-019
Strawberry OR, USA 1996	WG 50	4	0.84-0.85	0.10	fruit	0	1.3		TMN-024E-1 T402-STR96-020
Strawberry Nova Scotia Canada 1997	WG 50	4	0.84-0.85	0.09	fruit	0 0	0.55 0.59	0.57	402CANSTR97.217R T402-STR97-217
Strawberry Ontario Canada 1999	WG 50	4	0.83-0.89	0.24	fruit	0 0	1.04 1.30	1.2	99TOM02 T402-CANSTR99- 002R
Strawberry Quebec Canada 1999	WG 50	4	0.78-0.87	0.24	fruit	0 0	0.32 0.44	0.38	99TOM02 T402-CANSTR99- 003R
Strawberry British Columbia Canada 1999	WG 50	4	0.83-0.86	0.24	fruit	0 0 2 2 4 4 6 6 8 8 11 11 14 14	0.40 0.58 0.35 0.23 0.26 0.20 0.17 0.17 0.11 0.09 0.06 < 0.05 0.05 0.05	0.49 0.29 0.23 0.17 0.10 0.06 0.05	99TOM02 T402-CANSTR99- 004R

Table 32. Results of residue trials conducted with fenhexamid applied on strawberries in Japan (indoor).

Crop Country Year	Application FL	No.	kg ai/ha	kg ai/hL	Residues Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	Reference Study No. Trial Sub ID
Strawberry Japan 1997	WG 50	3	0.75	0.05	fruit	1 1 3 3 7 7	0.98 1.08 0.96 0.73 0.68 0.74	 1.0 0.85 0.71	NR 98022 NR98022-A
Strawberry Japan 1998	WG 50	3	1.0	0.05	fruit	1 1 3 3 7 7	1.79 1.74 1.36 1.28 < 0.01 < 0.01	 1.8 1.3 < 0.01	NR-98022 NR98022-B

Table 33. Results of residue trials conducted with fenhexamid applied on strawberries in Australia (outdoor).

Crop Country Year	Application FL	 No.	 kg ai/ha	 kg ai/hL	Residues Portion analysed	 PHI (days)	 Fenhexamid (mg/kg)	Reference Study No. Trial Sub ID
Strawberry Australia 1996	SC 500	5	0.50-0.75	0.05	fruit	0 1 3 5	4.8 3.1 2.1 1.3	RTL 442/97 AUS-RTL442-97-A
Strawberry Australia 1999	SC 500	5	0.50	0.08	fruit	0	0.53	DJR 200/00 AUS-DJR200-00-A
Strawberry Australia 1999	SC 500	5	0.40	0.05	fruit	0 1 3	2.5 2.7 1.6	DJR 200/00 AUS-DJR200-00-C
Strawberry Australia 1999	SC 500	5	0.50	0.10	fruit	0 1 3	3.0 3.8 3.9	RAV 087/00 AUS-RAV087-00-A
Strawberry Australia 1999	SC 500	5	0.56	0.05	fruit	0 1 3	5.4 5.6 4.3	RAV 087/00 AUS-RAV087-00-C
Strawberry Australia 2000	SC 500	5	0.50	0.1	fruit	0 1 3	0.54 0.46 0.37	RTL 552/00 AUS-RTL552-00-A
Strawberry Australia 2000	SC 500	5	0.50	0.1	fruit	0 1 3	5.9 3.9 3.4	RTL 552/00 AUS-RTL552-00-D

Berries and other small fruits

Bush berries (black currants and blue berries)

A total of eight trials was conducted with fenhexamid on black currants in northern Europe, and a further eight trials on blueberries in North America.

Table 34. Results of residue trials conducted with fenhexamid applied on black currants in Europe.

Crop Country Year	Application FL	 No.	 kg ai/ha	 kg ai/hL	Residues Portion analysed	 PHI (days)	 Fenhexamid (mg/kg)	Reference Study No. Trial Sub ID
Black currant UK 1995	WG 50	4	1.0	0.2	fruit	0* 0 1 3 7 10	1.1 2.0 1.7 1.6 1.7 1.4	RA-2051/95 0166-95
Black currant UK 1995	WG 50	4	1.0	0.2	fruit	0 3 7	1.3 0.64 0.93	RA-2051/95 0167-95
Black currant UK 1995	WG 50	4	1.0	0.2	fruit	0* 0 1 3 7 10	0.58 2.3 2.0 1.9 0.78 1.6	RA-2051/95 0507-95
Black currant UK 1995	WG 50	4	1.0	0.2	fruit	0 3 7	1.8 0.54 1.2	RA-2051/95 0508-95

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Black currant UK 1996	WG 50	4	1.0	0.2	fruit	0* 0 1 3 7	3.7 7.0 5.9 6.2 2.1	RA-2032/96 0033-96
Black currant Germany 1996	WG 50	4	1.0	0.2	fruit	0 3 7	6.7 1.1 1.0	RA-2032/96 0034-96
Black currant Germany 1996	WG 50	4	1.0	0.2	fruit	0* 0 1 3 7	2.5 3.5 4.4 1.9 1.7	RA-2032/96 0455-96
Black currant UK 1996	WG 50	4	1.0	0.2	fruit	0 3 7	2.1 1.9 1.8	RA-2032/96 0456-96

*before last application

Table 35. Results of residue trials conducted with fenhexamid applied on blueberry in the USA.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Blueberry GA, USA 2000	WG 50	4	0.86-0.87	0.18	berry	0 0	0.87 1.61	1.2	IR-4-06935 06935.00-GA*21
Blueberry ME, USA 2000	WG 50	4	0.86-0.88	0.16	berry	0 0	1.81 4.00	2.9	IR-4-06935 06935.00-ME06
Blueberry MI, USA 2000	WG 50	4	0.83-0.84	0.18	berry	0 0	2.76 2.91	2.8	IR-4-06935 06935.00-MI16
Blueberry MI, USA 2000	WG 50	4	0.82-0.84	0.18	berry	0 0	1.69 1.54	1.6	IR-4-06935 06935.00-MI17
Blueberry MI, USA 2000	WG 50	4	0.83-0.85	0.18	berry	0 0	1.87 1.52	1.7	IR-4-06935 06935.00-MI18
Blueberry NC, USA 2000	WG 50	4	0.80-0.85	0.15	berry	0 0	1.57 1.23	1.4	IR-4-06935 06935.00-NC21
Blueberry NJ, USA 2000	WG 50	4	0.84-0.85	0.16	berry	0 0	2.46 2.82	2.6	IR-4-06935 06935.00-NJ29
Blueberry OR, USA 2000	WG 50	4	0.85-0.91	0.16	berry	0 0	1.21 0.87	1.0	IR-4-06935 06935.00-OR07

Berries and other small fruits

Cane berries (raspberry and blackberry)

A total of fourteen trials were conducted with fenhexamid on cane fruit in northern Europe and North America.

Table 36. Results of residue trials conducted with fenhexamid applied on raspberry and blackberry in Europe and North America.

Crop Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Raspberry UK 1995	WG 50	4	1.0	0.2	berry	0 3 7	4.9 3.2 1.5		RA-2055/95 0168-95
Raspberry UK 1995	WG 50	4	1.0-1.1	0.2	berry	0* 0 1 3 7 10	2.1 4.2 4.0 3.5 1.6 0.99		RA-2055/95 0169-95
Raspberry UK 1995	WG 50	4	1.0	0.2	berry	0 3 7	3.7 1.6 0.90		RA-2055/95 0516-95
Raspberry UK 1995	WG 50	4	1.0	0.2	berry	0* 0 1 3 7 10	0.97 2.2 2.1 1.6 1.1 0.80		RA-2055/95 0518-95
Raspberry Germany 1996	WG 50	4	1.0	0.1	berry	0 3 7	5.5 3.6 2.0		RA-2031/96 0035-96
Raspberry UK 1996	WG 50	4	1.0	0.2	berry	0* 0 1 3 7	6.9 9.6 7.4 5.6 5.2		RA-2031/96 0036-96[(a)]
Raspberry Germany 1999	WG 50	4	1.0	0.1	fruit	0 1 3 7	8.9 8.8 5.7 4.0		RA-2031/99 0180-99
Raspberry UK 1999	WG 50	4	1.0	0.1	fruit	0 1 3 7	3.4 3.6 2.8 1.4		RA-2031/99 0488-99
Raspberry NC, USA 2000	WG 50	4	0.84-0.85	0.16	berry	0 0	16.11 6.41	11	IR-4-06840 06840.00-NC20
Raspberry NY, USA 2000	WG 50	4	0.79-0.83	0.15	berry	0 0	4.60 3.42	4.0	IR-4-06840 06840.00-NY24
Raspberry OR, USA 2000	WG 50	4	0.85-0.92	0.17	berry	0 0	0.458 0.638	0.55	IR-4-06840 06840.00-OR05
Raspberry B. Columbia Canada 2000	WG 50	4	0.84-0.86	0.08	berry	0 0	2.83 3.13	3.0	IR-4-06840 06840.00-BC05
Raspberry Ontario Canada 2000	WG 50	4	0.77-0.86	0.18	berry	0 0	12.54 8.79	11	IR-4-06840 06840.00-ON05
Blackberry OR, USA 2000	WG 50	4	0.87-0.88	0.18	berry	0 0	5.65 4.78	5.2	IR-4-06840 06840.00-OR06

* before last application

[a] not taken into consideration due to sparse canopy and low berry weight caused by the climatic conditions because the upper buds of the plants were destroyed by frost.

Tropical fruits – inedible peel

Kiwifruit

A total of nine post-harvest trials were conducted with fenhexamid on kiwi fruit in southern Europe and North America.

Table 37. Results of residue trials conducted with fenhexamid applied post-harvest on kiwi fruit in Europe and North America.

Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	g ai/100 kg fruit	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
Italy 1995	WG 50	1		0.075	fruit	0 30 60	4.9 3.7 4.0		RA-2045/95 0170-95
Italy 1995	WG 50	1		0.075	fruit	0 30 60	4.1 3.8 3.5		RA-2045/95 0497-95
Italy 1995	WG 50	1		0.075	fruit	0 30 60	5.4 5.3 6.3		RA-2045/95 0499-95
Italy 1995	WG 50	1		0.075	fruit	0 30 60	4.7 4.2 4.8		RA-2045/95 0500-95
CA, USA 2000	WG 50	1	0.38 packing line spray		fruit	0 0	2.45 4.59	3.5	IR-4-07600 07600.00-CA57-A
CA, USA 2000	WG 50	1		0.09 30 s dipping	fruit	0 0	9.02 10.03	9.5	IR-4-07600 07600.00-CA57-B
CA, USA 2000	WG 50	1	0.38 packing line spray		fruit	0 0	5.55 7.07	6.3	IR-4-07600 07600.00-CA58-A
CA, USA 2000	WG 50	1		0.09 30 s dipping	fruit	0 0	6.51 6.45	6.5	IR-4-07600 07600.00-CA58-B
OR, USA 2000	WG 50	1		0.09 30 s dipping	fruit	0 0	9.22 12.53	11	IR-4-07600 07600.00-OR08

Fruiting vegetables, cucurbits

Cucumber

In total, sixteen indoor trials were conducted in Europe on cucumber.

Table 38. Results of residue trials conducted with fenhexamid applied on cucumber in Europe (indoor).

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Belgium 1997	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.23 0.14 0.11 < 0.05	RA-2026/97 0021-97

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Italy 1997	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.18 0.10 0.07 < 0.05	RA-2026/97 0313-97
Greece 1997	WG 50	3	0.75	0.05	fruit	0 1 3	0.21 0.14 0.11	RA-2026/97 0314-97
Spain 1997	WG 50	3	0.75	0.05	fruit	0 1 3	0.16 0.14 0.05	RA-2026/97 0316-97
Belgium 1998	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.43 0.29 0.14 < 0.05	RA-2015/98 1005-98
Germany 1998	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.05 0.26 0.19 0.20 0.05	RA-2015/98 1325-98
Italy 1998	WG 50	3	0.75	0.05	fruit	0 1 3	1.0 0.61 0.65	RA-2015/98 1326-98
Spain 1998	WG 50	3	0.75	0.05	fruit	0 1 3	0.15 0.16 0.08	RA-2015/98 1327-98
Spain 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.18 0.15 0.13 0.07	RA-2096/99 0327-99
France-South 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.15 0.12 0.06 < 0.05	RA-2096/99 0328-99
Greece 1999	WG 50	3	0.75	0.075	fruit	0* 0 1 3 7	< 0.05 0.36 0.33 0.16 0.14	RA-2096/99 0329-99
The Nether- lands 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	< 0.05 0.26 0.19 0.14 < 0.05	RA-2097/99 0321-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.21 0.21 0.12	RA-2097/99 0322-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.19 0.19 0.16	RA-2097/99 0323-99
Belgium 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.27 0.20 0.05	RA-2097/99 0324-99
France-North 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.28 0.18 0.12	RA-2097/99 0325-99

* before last application

Fruiting vegetables, other than cucurbits

Tomato

In total, twenty-nine field and greenhouse trials were conducted on tomato in northern and southern Europe, using various formulations of fenhexamid.

Table 39. Results of residue trials conducted with fenhexamid applied on tomato in Europe (outdoor).

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Portugal 1995	WG 50	3	0.75	0.075	fruit	0* 0 1 3 7	0.11 0.64 0.42 0.29 0.15	RA-2059/95 0161-95
France 1995	WG 50	3	0.75	0.27	fruit	0* 0 1 3 8	0.28 0.50 0.62 0.32 0.10	RA-2059/95 0163-95
France 1995	WG 50	3	0.75	0.27	fruit	0* 0 1 3 7	0.19 0.67 0.17 0.32 0.21	RA-2059/95 0529-95
Portugal 1995	WG 50	3	0.75	0.075	fruit	0* 0 1 3 7	0.32 0.85 0.93 0.62 0.47	RA-2059/95 0531-95
France 1996	WG 50	3	0.75	0.075	fruit	0 1 3 7	0.51 0.29 < 0.05 < 0.05	RA-2034/96 0038-96
Italy 1996	WG 50	3	0.75	0.075	fruit	0 1 3 7	0.80 0.63 0.59 0.48	RA-2034/96 0050-96
France 1996	WG 50	3	0.75-0.8	0.075	fruit	0 1 3 7	0.52 0.21 0.34 0.07	RA-2034/96 0460-96

* before last application

Table 40. Results of residue trials conducted with fenhexamid applied on tomato in Europe (indoor).

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Spain 1996	WG 50	3	0.75	0.075	fruit	0 1 3 7	0.39 0.28 0.32 0.10	RA-2034/96 0462-96
France-South 1995	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.18 0.71 0.49 0.54 0.43	RA-2060/95 0164-95

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Italy 1995	WG 50	3	0.75	0.075	fruit	0* 0 1 3 7	0.30 0.51 0.51 0.27 0.72	RA-2060/95 0165-95
France-South 1995	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.13 0.34 0.40 0.30 0.30	RA-2060/95 0530-95
Italy 1995	WG 50	3	0.75	0.075	fruit	0* 0 1 3 7	0.29 0.47 0.41 0.35 0.32	RA-2060/95 0532-95
Germany 1996	WG 50	3	0.75	0.075	fruit	0 1 3 7	0.85 0.34 0.31 0.23	RA-2035/96 0046-96
Italy 1996	WG 50	3	0.75	0.05	fruit	0 1 3 7	0.47 0.39 0.42 0.33	RA-2035/96 0051-96
Belgium 1996	WG 50	3	1.5	0.075	fruit	0 1 3 7	1.2 0.96 0.74 0.53	RA-2035/96 0461-96 [(a)]
Greece 1996	WG 50	3	0.75	0.075	fruit	0 1 3 7	0.27 0.24 0.23 0.24	RA-2035/96 0463-96
Netherlands 1999	WG 50	3	0.71-0.75	0.05	fruit	0 1 3	0.33 0.24 0.23	RA-2035/99 0182-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.41 0.17 0.06	RA-2035/99 0183-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.57 0.23 0.25	RA-2035/99 0196-99
Belgium 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.99 0.80 0.59	RA-2035/99 0197-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.80 0.39 0.30	RA-2035/99 0198-99
Netherlands 1999	WG 50	3	0.70-0.75	0.05	fruit	0* 0 1 3 7	0.19 0.29 0.27 0.26 0.18	RA-2035/99 0199-99
Belgium 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.54 1.0 0.86 0.76 0.72	RA-2035/99 0201-99
Italy 1998	SC 500	3	0.75	0.075	fruit	0 1	0.60 0.63	RA-2014/98 1324-98
Belgium 1998	SC 500	3	0.75	0.075	fruit	0 1	0.35 0.34	RA-2014/98 1016-98

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Germany 1997	SC 416.7 (a)	3	0.63-0.70	0.035	fruit	0* 0 3 7 10	0.39 0.71 0.33 0.30 0.24	RA-2031/97 0139-97
Spain 1997	SC 416.7 (a)	3	0.60-0.70	0.035	fruit	0 3 7	0.27 0.21 0.19	RA-2031/97 0140-97
The Netherlands 1997	SC 416.7 (a)	3	0.70	0.035	fruit	0* 0 3 7 10	0.19 0.48 0.39 0.30 0.27	RA-2031/97 0325-97
Italy 1997	SC 416.7 (a)	3	0.56-0.63	0.035	fruit	0 3 7	0.32 0.28 0.20	RA-2031/97 0326-97

* before last application
(a) containing 350 g/L fenhexamid and 66.7 g/L tebuconazole

Fruiting vegetables, other than cucurbits

Sweet peppers

In total, eighteen greenhouse trials (indoor) were performed on sweet pepper in Europe, using WG 50 or SC 500 formulations of fenhexamid.

Table 41. Results of residue trials conducted with fenhexamid applied on sweet pepper in Europe (indoor).

Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
The Netherlands 1997	WG 50	3	0.5-0.56	0.05	fruit	0 1 3 7	0.58 0.67 0.44 0.41	RA-2027/97 0025-97
France, S 1997	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.22 0.52 0.38 0.35 0.20	RA-2027/97 0317-97
Italy 1997	WG 50	3	0.75	0.05	fruit	0 1 3	1.1 1.0 0.60	RA-2027/97 0318-97
Spain 1997	WG 50	3	0.75	0.05	fruit	0 1 3	0.73 0.75 0.64	RA-2027/97 0319-97
The Netherlands 1997	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.34 0.52 0.92 0.63 0.55	RA-2027/97 0803-97
Belgium 1998	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.67 1.1 0.89 0.84 0.65	RA-2016/98 1022-98

Country Year	Application				Residues			Reference
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	Study No. Trial Sub ID
Belgium 1998	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.49 1.0 0.76 0.67 0.66	RA-2016/98 1328-98
Italy 1998	WG 50	3	0.75	0.05	fruit	0 1 3	0.76 0.42 0.48	RA-2016/98 1330-98
Spain 1998	WG 50	3	0.70-0.75	0.05	fruit	0 1 3	0.49 0.41 0.31	RA-2016/98 1331-98
Portugal 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.37 0.84 0.45 0.38 0.34	RA-2094/99 0314-99
Italy 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.62 1.1 0.82 0.90 0.62	RA-2094/99 0315-99
France, South 1999	WG 50	3	0.75	0.05	fruit	0* 0 1 3 7	0.20 0.39 0.43 0.29 0.32	RA-2094/99 0316-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	1.4 1.5 0.73	RA-2095/99 0317-99
Germany 1999	WG 50	3	0.75	0.05	fruit	0 1 3	1.2 0.53 0.67	RA-2095/99 0318-99
The Netherlands 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.66 0.63 0.60	RA-2095/99 0319-99
Belgium 1999	WG 50	3	0.75	0.05	fruit	0 1 3	0.89 0.66 0.60	RA-2095/99 0320-99
Germany 1999	SC 500	3	0.75	0.05	fruit	0 1 3	2.3 0.86 0.77	RA-2095/99 0531-99
Italy 1999	SC 500	3	0.75	0.05	fruit	0* 0 1 3 7	0.44 1.1 0.84 0.66 0.51	RA-2094/99 0532-99

* before last application

Leafy vegetables

Lettuce

In total, 24 field and greenhouse trials on head (19) and leaf lettuce (5) were conducted in northern and southern Europe and covered 15 different varieties.

Table 42. Results of residue trials conducted with fenhexamid applied on lettuce in Europe (outdoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Head lettuce Germany 2000	WG 50	2	0.75	0.13	head	0 3 7	9.1 1.2 0.47	RA-2038/00 0264-00
Head lettuce UK 2000	WG 50	2	0.75	0.13	head	0 3 7	9.2 5.9 5.3	RA-2038/00 0265-00
Head lettuce Germany 2000	WG 50	2	0.75	0.13	head	0* 0 3 3 7 11	< 0.05 7.8 1.3 1.6 1.1 0.46	RA-2038/00 0266-00
Head lettuce The Netherlands 2000	WG 50	2	0.75	0.13	head	0* 0 3 7 10	0.17 6.7 0.86 0.24 0.13	RA-2038/00 0268-00
Head lettuce The Netherlands 2001	WG 50	2	0.75	0.13	head	0 3 7	13 10 2.0	RA-2067/01 0162-01
Head lettuce The Netherlands 2001	WG 50	2	0.75	0.13	head	0 3 7	7.7 0.20 0.10	RA-2067/01 0163-01
Head lettuce UK 2001	WG 50	2	0.75	0.13	head	0* 0 3 7 10	2.3 9.0 0.29 0.11 < 0.05	RA-2067/01 0164-01
Head lettuce Germany 2001	WG 50	2	0.75	0.13	head	0* 0 3 3 8 10	0.86 7.0 6.0 4.9 0.30 0.26	RA-2067/01 0165-01
Head lettuce Italy 1998	WG 50	2	0.75	0.075	head	0* 0 3 7	0.12 21 0.51 0.07	RA-2017/98 1101-98
Head lettuce Portugal 1998	WG 50	2	0.75	0.075	head	0* 0 3 7	0.41 20 2.2 0.84	RA-2017/98 1216-98
Head lettuce Italy 1998	WG 50	2	0.75	0.075	head	0 3 7	18 0.25 < 0.05	RA-2017/98 1333-98
Leaf lettuce Spain 1998	WG 50	2	0.75	0.075	leaf	0 3 7	12 1.1 0.48	RA-2017/98 1334-98
Leaf lettuce Italy 1999	WG 50	2	0.75	0.075	leaf	0* 0 3 7	0.33 8.5 4.7 2.7	RA-2017/99 0006-99
Leaf lettuce Spain 1999	WG 50	2	0.75-0.79	0.075	leaf	0* 0 2 7	1.5 6.8 3.9 0.94	RA-2017/99 0007-99
Head lettuce Portugal 1999	WG 50	2	0.75	0.075	head	0 3 7	9.0 2.0 0.69	RA-2017/99 0008-99

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Head lettuce France, S 1999	WG 50	2	0.75	0.075	head	0 3 7	9.1 6.0 2.0	RA-2017/99 0009-99

* before last application

Table 43. Results of residue trials conducted with fenhexamid applied on lettuce in Europe (indoor).

Crop Country Year	Application				Residues			Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg)	
Head lettuce Germany 2000	WG 50	2	0.75	0.13	head	0 3 7	7.9 1.9 1.3	RA-2032/00 0260-00
Leaf lettuce Italy 2000	WG 50	2	0.75	0.13	leaf	0 3 7	21 22 14	RA-2032/00 0261-00
Head lettuce Germany 2000	WG 50	2	0.75	0.13	head	0* 0 3 6 9	5.0 6.3 5.1 2.7 1.7	RA-2032/00 0262-00
Leaf lettuce Italy 2000	WG 50	2	0.75	0.13	leaf	0* 0 3 7 10	11 17 23 19 16	RA-2032/00 0263-00
Head lettuce Germany 2001	WG 50	2	0.75	0.13	head	0 3 6	19 15 11	RA-2068/01 0167-01
Head lettuce Italy 2001	WG 50	2	0.75	0.13	head	0 3 7	15 9.3 12	RA-2068/01 0168-01
Head lettuce Italy 2001	WG 50	2	0.75	0.13	head	0* 0 3 7 10	4.9 14 2.3 6.4 1.7	RA-2068/01 0169-01
Head lettuce Germany 2001	WG 50	2	0.75	0.13	head	0* 0 3 7 10	12 23 21 17 14	RA-2068/01 0170-01

* before last application

Tree nuts

Almonds

In total, five field trials were conducted in 1997 in the USA with fenhexamid WG 50 on almonds.

Table 44. Results of residue trials conducted with fenhexamid applied on almonds in the USA.

Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
USA 1997	WG 50	4	0.83-0.85	0.026- 0.036	hull	144 144	0.137 0.157	0.15	TMN-020-1 T402-ALM97- 212
					nut without shell	144 144	< 0.02 < 0.02	< 0.02	

Country Year	Application				Residues				Reference Study No. Trial Sub ID
	FL	No.	kg ai/ha	kg ai/hL	Portion analysed	PHI (days)	Fenhexamid (mg/kg) single value	mean value	
USA 1997	WG 50	4	0.82-0.85	0.026-0.036	hull	148 148	1.028 1.076	1.1	TMN-020-1 T402-ALM97-213
					nut without shell	148 148	< 0.02 < 0.02	< 0.02	
USA 1997	WG 50	4	0.83-0.85	0.025-0.036	hull	142 142	0.452 0.489	0.47	TMN-020-1 T402-ALM97-214
					nut without shell	142 142	< 0.02 < 0.02	< 0.02	
USA 1997	WG 50	4	0.84-0.85	0.026-0.036	hull	173 173	0.728 0.803	0.77	TMN-020-1 T402-ALM97-215
					nut without shell	173 173	< 0.02 < 0.02	< 0.02	
USA 1997	WG 50	4	0.83-0.85	0.026-0.036	hull	148 148	0.426 0.661	0.54	TMN-020-1 T402-ALM97-216
					nut without shell	148 148	< 0.02 < 0.02	< 0.02	

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No information received.

In processing

Effect of processing on the nature of residues

The hydrolytic degradation of fenhexamid was investigated under representative conditions of processing (PF4166, Riegner, 1996):

pH value	Time (min)	Temperature (°C)
4	20	90
5	60	100
6	20	120

The results showed that the parent compound is not significantly affected by these processes. At the end of the study the content of radioactive labelled fenhexamid was in the range of 95.7% to 100.2% (mean 97.8%) of applied radioactivity. It is therefore unlikely that processing will affect the nature of fenhexamid residue. Due to this fact, the active substance itself is considered the relevant residue in all studies on the effect of processing on the magnitude of the residues.

Effect of processing on the level of residues

Processing studies were carried out on cherries, plums, grapes, strawberries and tomatoes. These studies involved processing the raw agricultural commodities (RAC) into beverages (juice, wine and must), preserves, jam, sauce, paste and dried fruits. In addition, "pseudo-processing" trials were conducted with fenhexamid in lettuce, to evaluate the effects of washing and removal of the outer wrapper leaves.

Cherries

In 1995 and 1998, two processing trials were conducted with fenhexamid on sweet cherry in Italy (RA-3050/95, Nuesslein and Walz-Tylla, 1996) and on sour cherry in Germany (RA-3013/98, Nuesslein and Block, 1999).

Fenhexamid WG 50 or SC 500 was applied up to four times at rates of 0.335 (RA-3013/98) or 0.75 kg ai/ha (RA-3050/95) with spray concentrations of 0.05% or 0.075% ai. Samples were collected at harvest (day 1). One sample was taken from study RA-3050/95 and one sample from study RA-3013/98 (which underwent three separate processing steps). Residues were determined in the RAC, in washed fruit, preserve and juice. The washing of cherries followed domestic practice. The preparation of cherry preserve and juice simulated industrial practice, but on a laboratory scale (see figure 4). A summary of the results and the calculated processing factors (PF) is given in Table 45. The abbreviation PF is used for processing factor.

Table 45. Results from processing studies on cherry.

Portion analysed	fenhexamid residues mg/kg	PF trial A	fenhexamid residues mg/kg	PF trial B	fenhexamid residues mg/kg	PF trial C	PF PF mean	Study No. Trial SubID
fruit	0.86							RA-3050/95
fruit, washed	0.31	0.36					0.36	0048-95
preserve	0.17	0.198					0.198	
juice	< 0.02	0.02					0.02	
fruit	1.0		1.0		1.0			RA-3013/98[1]
fruit, washed	0.39	0.40	0.55	0.60	0.49	0.50	0.50	1017-98
preserve	0.29	0.29	0.25	0.25	0.26	0.26	0.27	A, B, C

[1] One sample was processed three times (A, B, C) separately.

Plums

In 1995 one processing trial was performed with fenhexamid on plums in Italy (RA-3048/95, Heinemann and Nuesslein, 1996). Fenhexamid WG 50 was applied four times at a rate of 0.75 kg ai/ha (spray concentration 0.05% ai). Samples were collected at harvest (day 1). Plums were processed to sauce (see figure 5) and prunes (see figure 6) following domestic practice. The plums were washed in standing water, using slow movement, then pitted manually.

The analytical results for plums show that fenhexamid residues were below LOQ (0.05 mg/kg) in all matrices, including the raw agricultural commodity (RAC), except prunes. Residues in prunes were 0.1 mg/kg fenhexamid (see Table 46). No processing factor (PF) could be calculated.

Table 46. Results from processing studies on plums.

Country	Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
Italy	plum	fruit	1	< 0.05		RA-3048/95
		fruit, washed	1	< 0.05		0051-95
		sauce	1	< 0.05		
		dried prune	1	0.1		

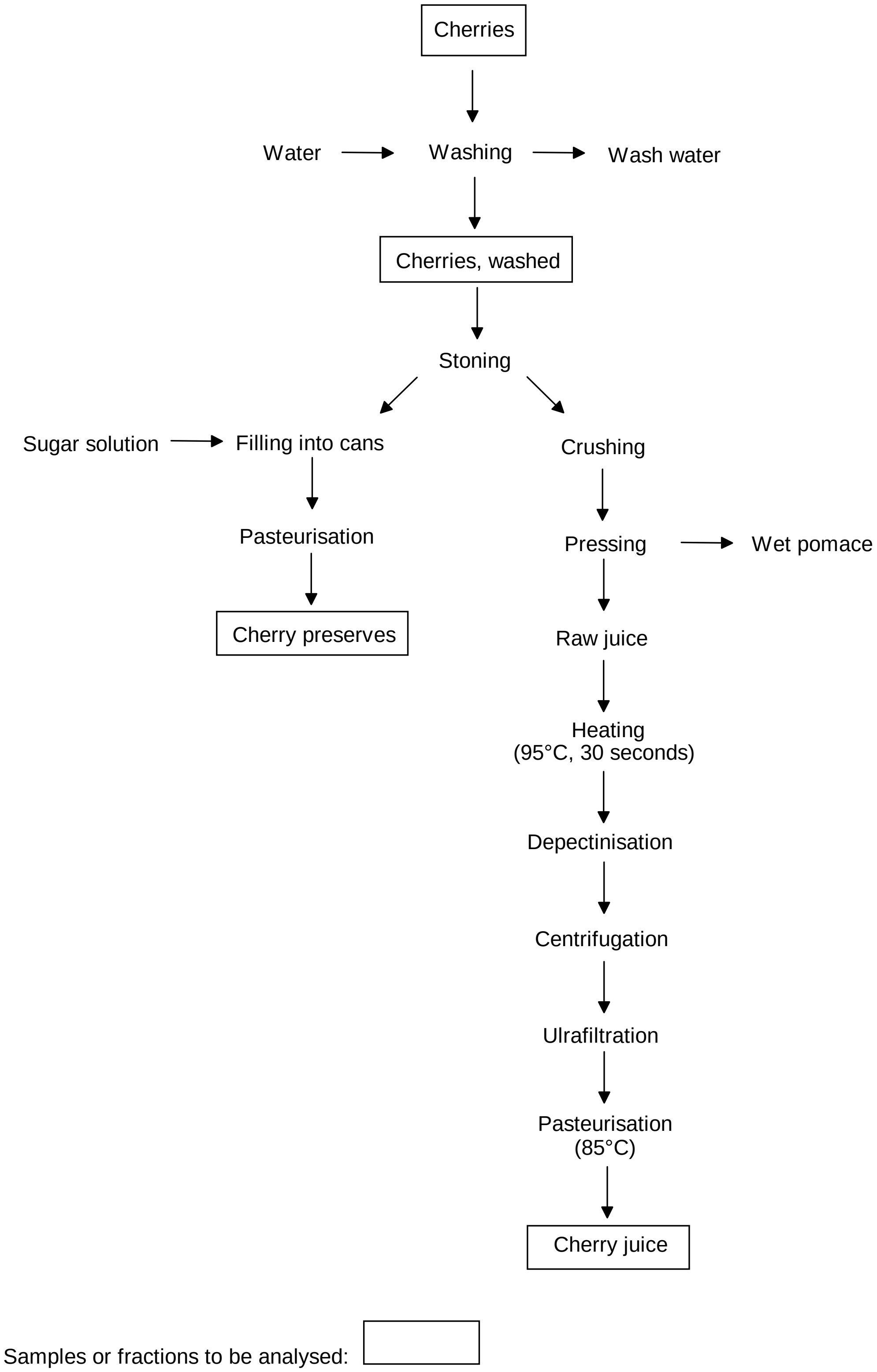


Figure 4. Flow diagram describing the preparation of cherry preserve and juice.

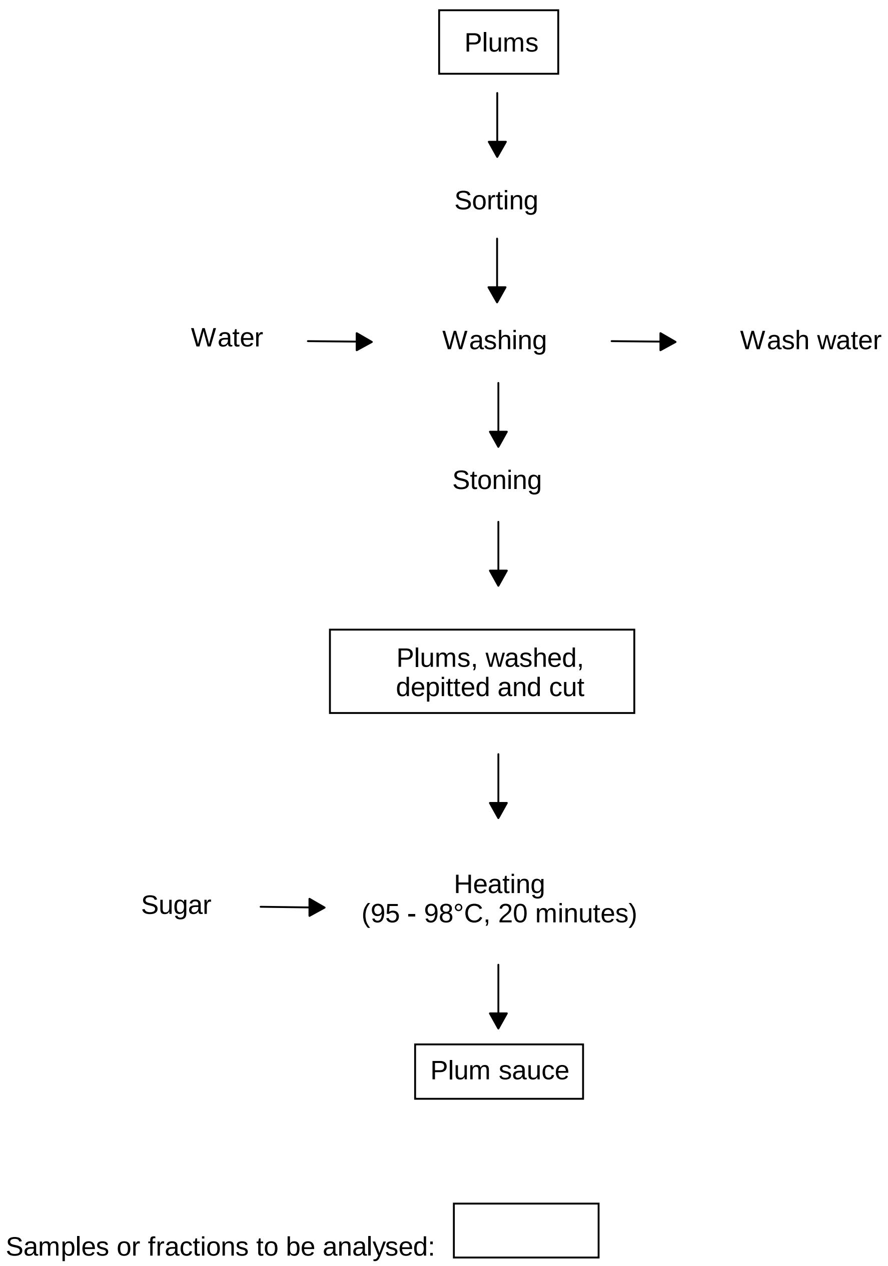


Figure 5. Flow diagram describing the preparation of washed plums and sauce.

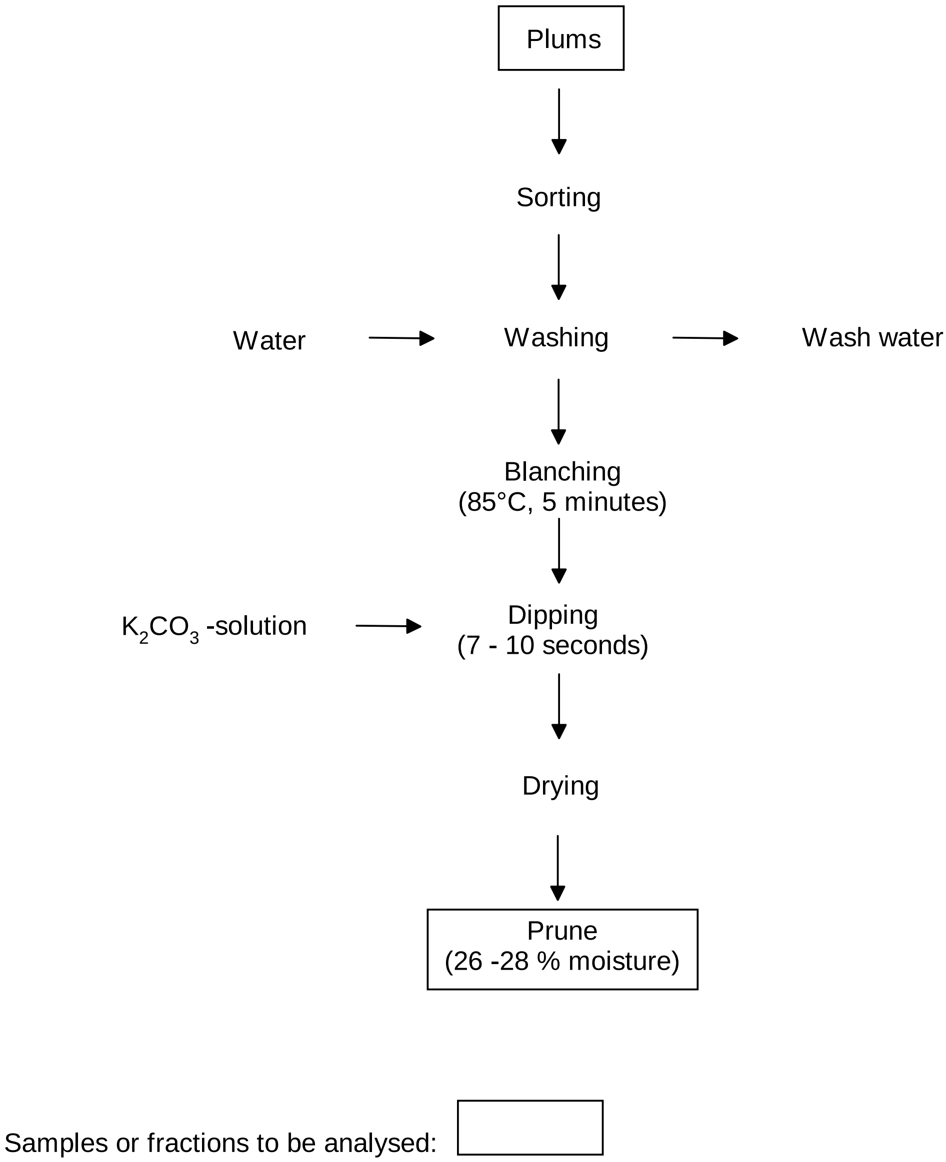


Figure 6. Flow diagram describing the preparation of prunes.

Grapes

Wine preparation

Seven wine processing studies were conducted in 1994 and 1995 in Germany (4 trials), France (2 trials) and Spain (1 trial) using different varieties of grape. In general, the vinification to white and red wine in these countries is similar. The results of vinification in the European trials are summarised in Table 47 (RA-3045/94, Nuesslein and Walz-Tylla, 1996; RA-3118/94, Nuesslein, 1996; RA-3056/95, Nuesslein and Walz-Tylla, 1996; RA-3057/95, Nuesslein and Walz-Tylla, 1996). The abbreviation PF is used for processing factor.

From Germany four trials are available, two white and two red varieties. In 1994 fenhexamid WG 50 was applied to grapes three times at a concentration of 0.11%, corresponding to a rate of approximately 0.45-0.6 kg ai/ha depending on the spray volume (400-533 L/ha) used. Due to a change in the use pattern, the first treatment at growth stage "berries pea-sized" was cancelled in the 1995 trials, so the number of applications was reduced from 3 to 2. The application rate was raised to 0.73 to 0.84 kg ai/ha, depending on the growth stage treated (0.16% w/v fenhexamid). Samples were taken 21 days after the last treatment. The processing in Germany took place on a semi-commercial scale and involved the following steps: crushing and pressing of unwashed grapes, fining/clarification, fermentation, racking and filtration (see Figures 7 and 8).

In 1994, two trials were conducted in Southern France. Fenhexamid WG 50 was applied three times at a rate of 0.5 kg ai/ha (0.5%) to white and red grape varieties. Samples collected 21 days after the final application were processed to must and wine, on a semi-commercial scale under actual processing conditions (see Figure 9). To obtain must, the unwashed grapes were pressed or crushed. The liquid contains lees with residues bound to the particles. Alcoholic fermentation was followed by malolactic fermentation. After clarification and filtration, the wine was bottled.

In the 1995 trial conducted in Spain, fenhexamid was applied to white grapes three times at a rate of 0.5 kg ai/ha (0.063-0.11% w/v ai). Samples taken 21 days after the final application were processed to wine in Germany. The procedure was the same as in the German trials and is described in Figures 7 and 8. Two slight modifications were introduced: after clarification with Bentonite, sugar was added, and no SO_2 was added between the second racking and filtration.

In Australia, twelve processing trials were carried out with fenhexamid during 2000 (DJR 191/00, Riches, 2000; PJH 315/00, Hamblin, 2000; RTL 539/00, Loveless). The number of applications and the application rate varied in the trials. Fenhexamid was applied either once or twice with a spray concentration of 0.05-0.1%, corresponding to application rates of between 1.95-2.08 or 3.9-4.15 kg ai/ha. Grape samples for must and wine processing were taken on days 0, 14, 21, 28 and 35 after the last treatment. For processing to wine, the berries were hand-crushed and potassium metasulphite and diammonium phosphate solutions were added (see Figure 10). The must was inoculated with rehydrated active dried wine yeast and fermented on skins at 25 °C with daily mixing. After 7 days, the ferment was separated into marc and wine by pressing it twice, each time at 20 psi for 3 min, mixing the wet pomace (marc) between pressings. After further fermentation (25 °C), a potassium metabisulphite solution was added and the wine was stored at 2 °C prior to analysis. A summary of the results is given in Table 48. The abbreviation PF is used for processing factor.

Table 47. Results from studies on processing grapes to wine in Europe.

Country	Commodity	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
France-South	grape, red	bunch of grapes must wine at bottling wine at first taste test	1.1 0.99 0.37 0.36	 0.90 0.34 0.33	RA-3045/94 0185-94
France-South	grape, white	bunch of grapes must wine at bottling wine at first taste test	0.35 0.14 0.16 0.16	 0.40 0.46 0.46	RA-3045/94 0186-94
Germany	grape, red	bunch of grapes must wine at bottling wine at first taste test	0.26 0.05 0.06 0.06	 0.19 0.23 0.23	RA-3118/94 0460-94
Germany	grape, white	bunch of grapes must wine at bottling wine at first taste test	0.15 0.08 0.06 0.06	 0.53 0.40 0.40	RA-3118/94 0461-94
Germany	grape, red	bunch of grapes must wine at bottling	0.69 0.30 0.15	 0.43 0.22	RA-3056/95 0146-95
Germany	grape, white	bunch of grapes must	0.85 0.20	 0.24	RA-3056/95 0523-95

Country	Commodity	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
		wine at bottling	0.18	0.21	
Spain	grape, white	bunch of grapes wine	0.12 0.05	 0.42	RA-3057/95 0087-95

wine at bottling = wine 1, wine at first taste test = wine 2

Table 48. Results from studies on processing grapes to wine in Australia.

Commodity	Portion analysed	PHI (days)	fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
grape, red	berry	0 14 21 28 35	10.2 1.83 3.47 1.25 1.34		DJR 191/00 AUS-DJR191-00-A
	wine	0 14 21 28 35	2.06 0.62 0.84 0.63 0.64	0.20 0.34 0.24 0.50 0.48 mean 0.352 max 0.5	
	pomace, wet (marc)	0 14 21 28 35	34.1 8.46 13.2 8.80 9.28	3.34 4.62 3.80 7.04 6.93 mean 5.15 max 7.04	
grape, red	berry	0 14 21 28 35	19.2 15.3 9.80 10.4 1.69		DJR 191/00 AUS-DJR191-00-B
	wine	0 14 21 28 35	5.88 3.17 1.96 2.02 1.52	0.31 0.21 0.20 0.19 0.90 mean 0.362 max 0.31	
	pomace, wet (marc)	0 14 21 28 35	88.6 58.9 30.3 15.7 22.3	4.61 3.85 3.09 1.51 13.2 mean 5.25 max 4.61	
grape, red	berry	0 14 21 28 35	10.1 0.87 0.86 0.49 0.28		DJR 191/00 AUS-DJR191-00-C
	wine	0 14 21 28 35	2.21 0.78 0.41 0.40 0.18	0.22 0.90 0.48 0.82 0.64 mean 0.612 max 0.90	

Commodity	Portion analysed	PHI (days)	fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
	pomace, wet (marc)	0 14 21 28 35	38.4 11.9 6.85 5.22 2.78	3.80 13.7 7.97 10.7 9.93 mean 9.22 max 13.7	
grape, red	berry	0 14 21 28 35	23.8 10.8 10.8 8.92 5.63		DJR 191/00 AUS-DJR191-00-D
	wine	0 14 21 28 35	4.91 3.34 2.91 1.51 1.09	0.21 0.31 0.27 0.17 0.19 mean 0.23 max 0.31	
	pomace, wet (marc)	0 14 21 28 35	94.4 66.0 54.3 23.7 16.2	3.97 6.11 5.03 2.66 2.88 mean 4.13 max 6.11	
grape, red	berry	0 14 21 28 35	2.92 2.04 1.34 1.52 1.33		PJH 315/00 AUS-PJH315-00-A
	wine	0 14 21 28 35	0.59 0.38 0.20 0.20 0.23	0.20 0.19 0.15 0.13 0.17 mean 0.168 max 0.20	
	pomace, wet (marc)	0 14 21 28 35	16.5 6.87 4.49 5.30 4.87	5.65 3.37 3.35 3.49 3.66 mean 3.9 max 5.65	
grape, red	berry	0 14 21 28 35	9.56 9.15 3.96 4.41 2.92		PJH 315/00 AUS-PJH315-00-B
	wine	0 14 21 28 35	1.06 1.30 0.68 1.00 0.49	0.11 0.14 0.17 0.23 0.17 mean 0.164 max 0.23	
	pomace, wet (marc)	0 14 21 28 35	18.8 22.1 15.4 19.4 10.8	1.97 2.42 3.89 4.40 3.70 mean 3.28 max 4.4	

Commodity	Portion analysed	PHI (days)	fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
grape, red	berry	0 14 21 28 35	3.30 1.50 1.38 1.43 0.96		PJH 315/00 AUS-PJH315-00-C
	wine	0 14 21 28 35	0.50 0.27 0.24 0.29 0.15	0.15 0.18 0.17 0.20 0.16 mean 0.172 max 0.20	
	pomace, wet (marc)	0 14 21 28 35	10.9 4.75 4.33 4.23 3.42	3.30 3.17 3.14 2.96 3.56 mean 3.23 max 3.56	
grape, red	berry	0 14 21 28 35	10.1 5.78 2.77 3.08 2.85		PJH 315/00 AUS-PJH315-00-D
	wine	0 14 21 28 35	1.40 0.94 0.52 0.72 0.58	0.14 0.16 0.19 0.19 0.20 mean 0.176 max 0.20	
	pomace, wet (marc)	0 14 21 28 35	35.2 14.2 9.97 12.9 10.6	3.49 2.46 3.60 3.39 3.72 mean 3.33 max 3.72	
grape, red	berry	0 14 21 28 35	5.70 4.81 3.75 4.66 2.96		RTL 539/00 AUS-RTL539-00-A
	wine	0 14 21 28 35	1.05 0.94 0.82 0.94 0.70	0.18 0.20 0.22 0.20 0.24 mean 0.208 max 0.24	
	pomace, wet (marc)	0 14 21 28 35	25.4 20.2 17.2 20.6 16.1	4.46 4.20 4.59 4.42 5.44 mean 4.62 max 5.44	
grape, red	berry	0 14 21 28 35	9.64 11.2 9.21 5.34 5.66		RTL 539/00 AUS-RTL539-00-B

Commodity	Portion analysed	PHI (days)	fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
	wine	0	1.80	0.19	
		14	2.20	0.20	
		21	1.77	0.19	
		28	1.18	0.22	
		35	1.66	0.29	
				mean 0.218	
				max 0.29	
	pomace, wet (marc)	0	38.4	3.98	
		14	36.3	3.24	
		21	31.4	3.41	
		28	25.6	4.79	
		35	29.5	5.21	
				mean 4.13	
				max 5.21	
grape, red	berry	0	4.13		RTL 539/00 AUS-RTL539-00-C
		14	2.96		
		21	3.45		
		28	3.11		
		35	1.91		
	wine	0	1.13	0.27	
		14	0.64	0.22	
		21	0.60	0.17	
		28	0.67	0.22	
		35	0.36	0.19	
				mean 0.214	
				max 0.27	
	pomace, wet (marc)	0	20.5	4.96	
		14	12.2	4.12	
		21	12.4	3.59	
		28	12.5	4.02	
		35	7.60	3.98	
				mean 4.13	
				max 4.96	
grape, red	berry	0	9.73		RTL 539/00 AUS-RTL539-00-D
		14	11.7		
		21	5.71		
		28	7.20		
		35	6.72		
	wine	0	2.12	0.22	
		14	1.44	0.12	
		21	1.59	0.28	
		28	1.44	0.20	
		35	1.53	0.23	
				mean 0.21	
				max 0.28	
	pomace, wet (marc)	0	44.1	4.53	
		14	30.2	2.58	
		21	31.2	5.46	
		28	24.8	3.44	
		35	26.4	3.93	
				mean 3.99	
				max 5.46	

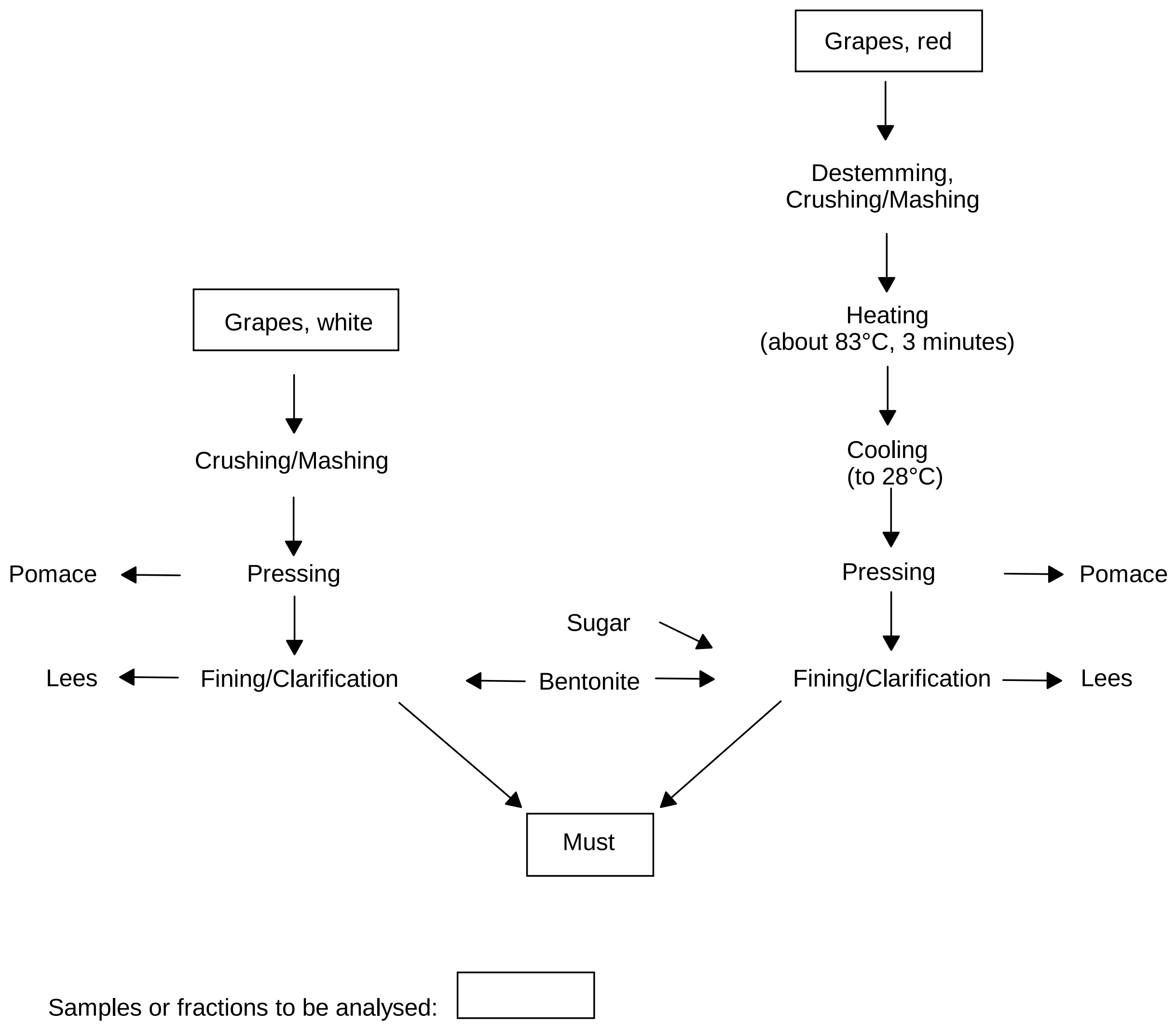


Figure 7. Flow diagram describing the preparation of must from white and red grapes (Germany).

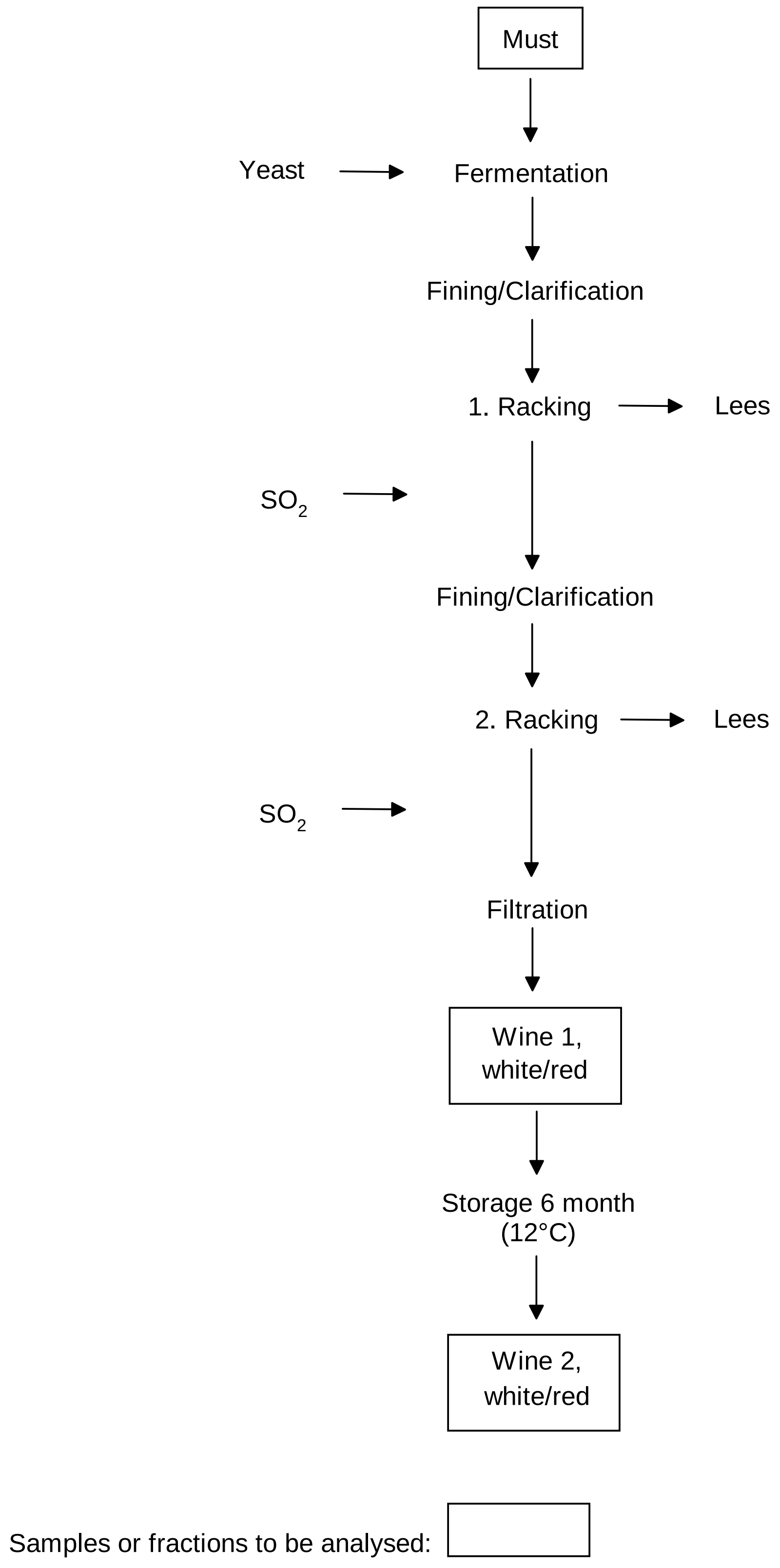


Figure 8. Flow diagram describing the preparation of white and red wine from must (Germany).

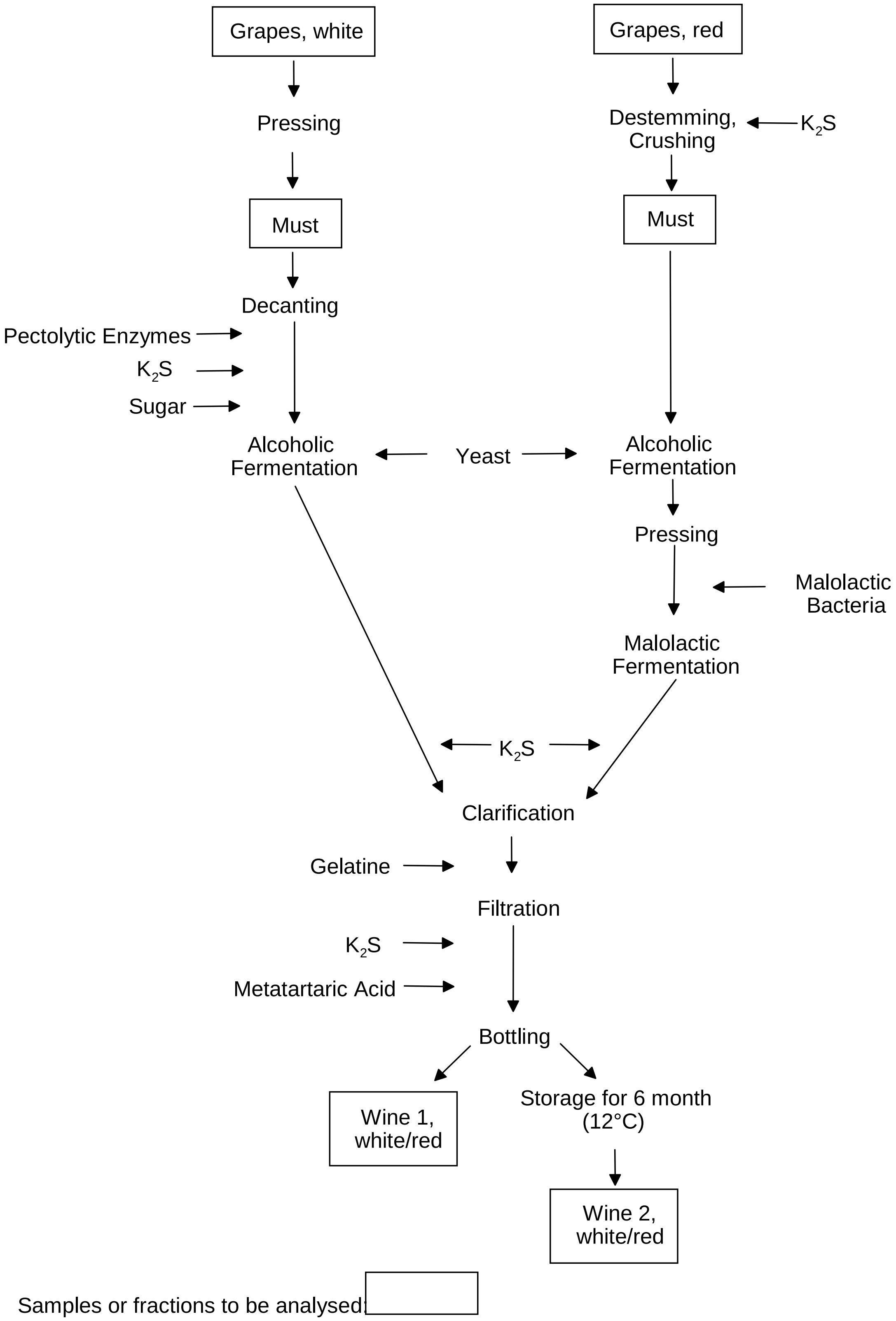


Figure 9. Flow diagram describing the preparation of white and red wine from grapes (France).

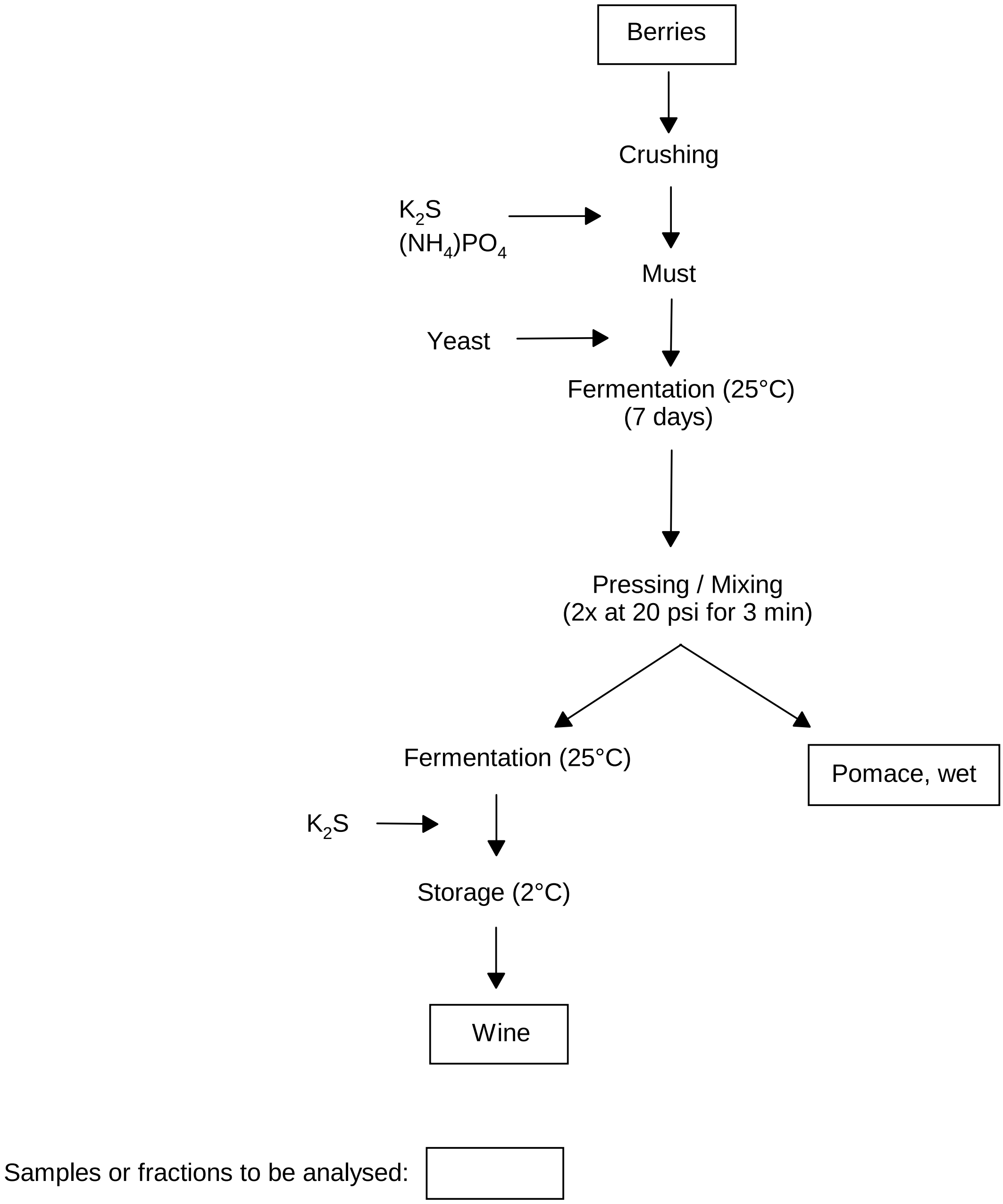


Figure 10. Flow diagram describing the preparation of wine and pomace, wet/marc (Australia).

Grapes

Juice preparation

In France (1994) and Spain (1995) grapes were processed into juice, by simulating industrial practice on a laboratory scale (RA-3045/94, Nuesslein and Walz-Tylla, 1996; RA-3057/95, Nuesslein and Walz-Tylla, 1996). Fenhexamid was applied 3 times at a rate of 0.5 kg ai/ha corresponding to spray concentrations of 0.063 - 0.5% ai. Grape bunches were found to contain residues of 0.1 - 1.1 mg/kg on 21 days post-treatment. The processing procedure was the same for all studies (see Figure 12), but different matrices were analysed. A summary of the results is given in Table 49. The abbreviation PF is used for processing factor.

In the USA grapes were processed to raw stewed juice, pasteurised juice, clarified juice and canned juice following a typical US commercial processing procedure (TMN-021R-1, Sehn, 1998). Vines were treated three times with 0.56 kg ai/ha fenhexamid (0.028 - 0.056% ai) and samples were taken immediately after treatment (day 0). The processing included the following steps: Crushing/de-stemming, depectination, pressing, pasteurisation, settling, filtration and canning (see Figure 13). The results are shown in detail in Table 49.

In the Australian residue trials on grapes (DJR 191/00, Riches, 2000; PJH 315/00, Hamblin, 2000; RTL 539/00, Loveless, 2000), fenhexamid was applied once or twice with a spray concentration of 0.05−0.1%, corresponding to application rates between 1.95 - 2.1 or 3.9 - 4.15 kg ai/ha. Grapes for juice processing were sampled 0, 14, 21, 28 and 35 days after the last treatment. For analysis of fresh grapes, the sampled berries were chilled to approximately –80°C prior to blending. For juice production the berries were pressed twice, each at 20 psi for 3 min, with mixing of the skins between pressings. Sodium metabisulphite solution was added and the juice was stored at 2°C prior to analysis (see Figure 11). Juice produced in this way is similar to raw juice. Results are summarised in Table 50. The abbreviation PF is used for processing factor.

Table 49. Results from studies on processing grapes to juice in Europe and the USA..

Country	Commodity	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
France	grape, red	bunch of grapes juice pomace, wet pomace, dried	1.1 0.05 1.7 2.7	 0.045 1.55 2.45	RA-3045/94 0185-94
France	grape, white	bunch of grapes juice pomace, wet pomace, dried	0.35 < 0.02 0.68 1.8	 < 0.06 1.94 5.14	RA-3045/94 0186-94
Spain	grape, white	bunch of grapes juice raw stewed juice	0.12 < 0.02 < 0.02	 < 0.17 < 0.17	RA-3057/95 0087-95
USA	grape, red	bunch of grapes raw stewed juice juice, pasteurised juice, clarified juice, canned	0.62 0.16 0.18 0.084 0.086	 0.26 0.29 0.14 0.14	TMN-021R-1 T402-GRA97-217

Table 50. Results from studies on processing grapes to juice in Australia.

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
grape, red	berry	0 14 21 28 35	10.2 1.83 3.47 1.25 1.34		DJR 191/00 AUS-DJR191-00-A
	juice	0 14 21 28 35	3.65 0.41 0.52 0.49 0.37	0.36 0.22 0.15 0.39 0.28 mean 0.28 max 0.39	
grape, red	berry	0 14 21 28 35	19.2 15.3 9.80 10.4 1.69		DJR 191/00 AUS-DJR191-00-B

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
	juice	0 14 21 28 35	13.1 2.86 1.75 1.70 1.04	0.68 0.19 0.18 0.16 0.62 mean 0.366 max 0.68	
grape, red	berry	0 14 21 28 35	10.1 0.87 0.86 0.49 0.28		DJR 191/00 AUS-DJR191-00-C
	juice	0 14 21 28 35	6.64 0.49 0.35 0.26 0.14	0.66 0.56 0.41 0.53 0.50 mean 0.532 max 0.66	
grape, red	berry	0 14 21 28 35	23.8 10.8 10.8 8.92 5.63		DJR 191/00 AUS-DJR191-00-D
	juice	0 14 21 28 35	13.1 4.14 4.43 1.56 0.58	0.55 0.38 0.41 0.17 0.10 mean 0.322 max 0.55	
grape, red	berry	0 14 21 28 35	2.92 2.04 1.34 1.52 1.33		PJH 315/00 AUS-PJH315-00-A
	juice	0 14 21 28 35	1.23 0.76 0.36 0.47 0.65	0.42 0.37 0.27 0.31 0.49 mean 0.372 max 0.49	
grape, red	berry	0 14 21 28 35	9.56 9.15 3.96 4.41 2.92		PJH 315/00 AUS-PJH315-00-B
	juice	0 14 21 28 35	3.72 3.12 1.47 2.24 0.97	0.39 0.34 0.37 0.51 0.33 mean 0.388 max 0.51	
grape, red	berry	0 14 21 28 35	3.30 1.50 1.38 1.43 0.96		PJH 315/00 AUS-PJH315-00-C

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
	juice	0 14 21 28 35	1.15 0.62 0.61 0.47 0.34	0.35 0.41 0.44 0.33 0.35 mean 0.376 max 0.44	
grape, red	berry	0 14 21 28 35	10.1 5.78 2.77 3.80 2.85		PJH 315/00 AUS-PJH315-00-D
	juice	0 14 21 28 35	3.28 2.16 1.16 1.94 1.25	0.32 0.37 0.42 0.51 0.44 mean 0.412 max 0.51	
grape, red	berry	0 14 21 28 35	5.70 4.81 3.75 4.66 2.96		RTL 539/00 AUS-RTL539-00-A
	juice	0 14 21 28 35	4.19 2.31 2.30 3.74 1.52	0.74 0.48 0.61 0.80 0.51 mean 0.628 max 0.80	
grape, red	berry	0 14 21 28 35	9.64 11.2 9.21 5.34 5.66		RTL 539/00 AUS-RTL539-00-B
	juice	0 14 21 28 35	6.21 6.97 5.09 7.22 3.81	0.64 0.62 0.55 1.35 0.67 mean 0.766 max 1.35	
grape, red	berry	0 14 21 28 35	4.13 2.96 3.45 3.11 1.91		RTL 539/00 AUS-RTL539-00-C
	juice	0 14 21 28 35	3.26 1.61 1.64 1.72 0.96	0.79 0.54 0.48 0.55 0.50 mean 0.572 max 0.79	
grape, red	berry	0 14 21 28 35	9.73 11.7 5.71 7.20 6.72		RTL 539/00 AUS-RTL539-00-D

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
	juice	0 14 21 28 35	6.34 3.46 4.35 5.60 3.60	0.65 0.30 0.76 0.78 0.54 mean 0.606 max 0.78	

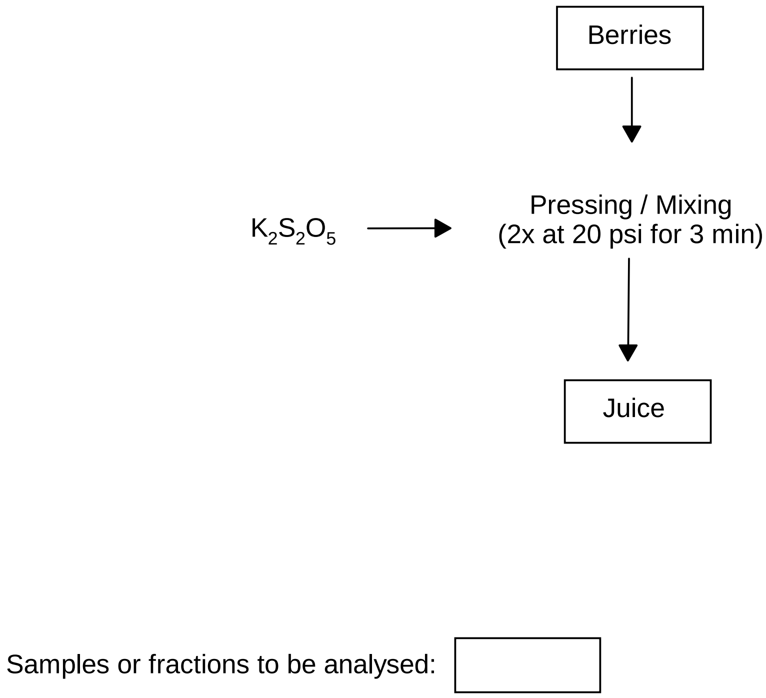


Figure 11. Flow diagram describing the preparation of juice from grapes (Australia).

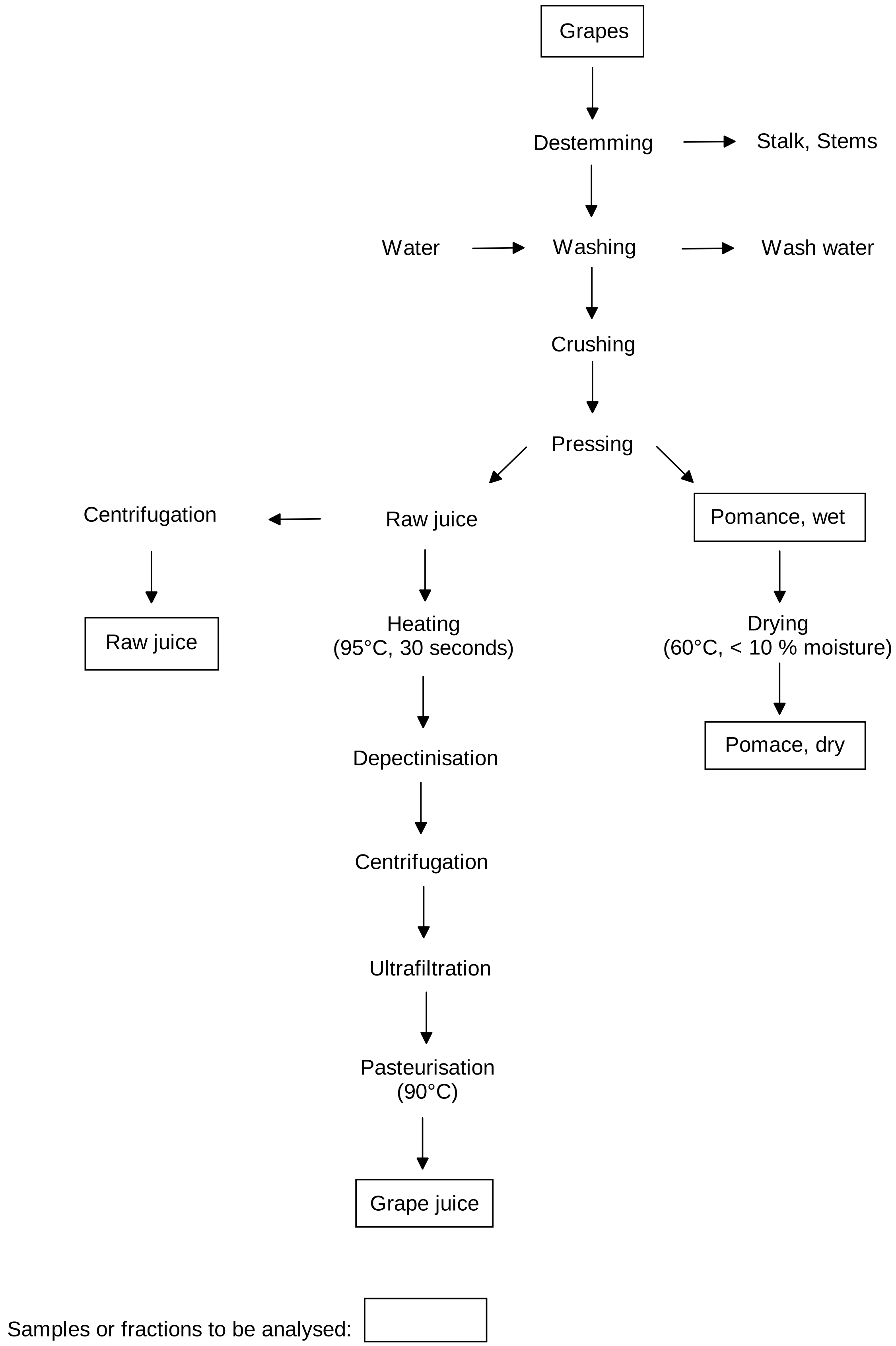


Figure 12. Flow diagram describing the preparation of juice from grapes (Europe).

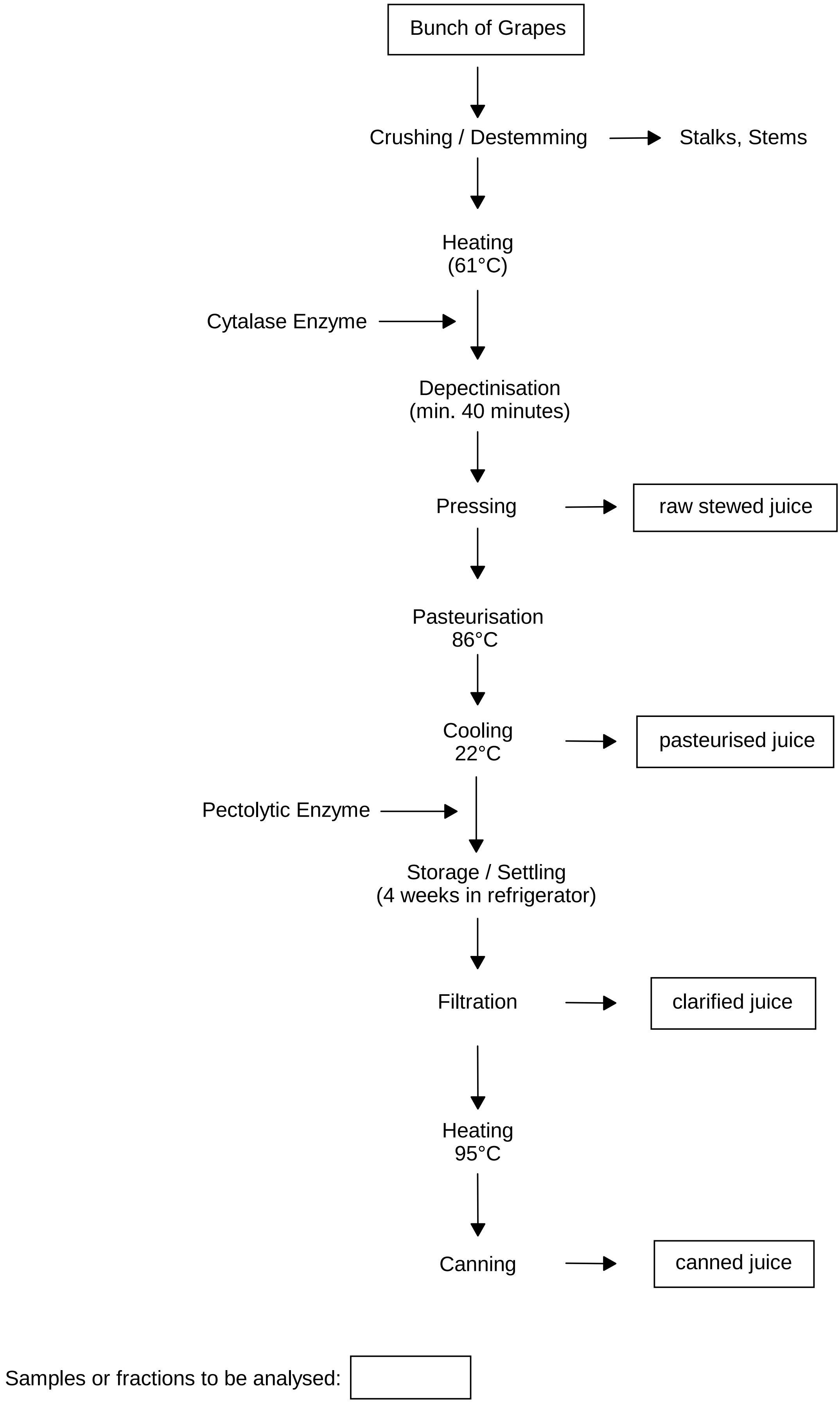


Figure 13. Flow diagram describing the preparation of juice from grapes (USA).

Grapes

Raisins

Grapes from the field trials in Southern Europe (France and Spain) were also processed to raisins (RA-3045/94, Nuesslein and Walz-Tylla, 1996; RA-3057/95, Nuesslein and Walz-Tylla, 1996). Fenhexamid was applied three times at an application rate of 0.5 kg ai/ha. Samples were harvested 21 days after the final treatment. The preparation of raisins and raisin waste was according to current industrial procedures, but on a laboratory scale and to domestic practice (see Figure 14). The procedures are similar, differing only in the length of drying period (15 or 30 hours) and the moisture content of the raisins (7–8% versus 12–14%). A summary of the results is given in Table 51. The abbreviation PF is used for processing factor.

Grapes from field trials in Australia were processed to raisins (DJR 192/00, Riches, 2000; MWS 450/00, Sumner, 2000). Fenhexamid was applied 1 or 2 times using spray concentrations of 0.05 and 0.1% ai (1.5–5.2 kg ai/ha). The berries were sampled and processed on days 14, 21, 28 and 35 after the last application. After picking, fruit samples were dried for 21 days in drying racks then frozen. All results are shown in Table 52. The abbreviation PF is used for processing factor.

Table 51. Results from studies on processing grapes to raisins in Europe.

Country	Commodity	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
France	grape, red	bunch of grapes raisin raisin waste	1.1 2.0 7.3	 1.82 6.64	RA-3045/94 0185-94
France	grape, white	bunch of grapes raisin raisin waste	0.35 0.65 5.70	 1.86 16.3	RA-3045/94 0186-94
Spain	grape, white	bunch of grapes raisin	0.12 0.29	 2.42	RA-3057/95 0087-95

Table 52. Results from studies on processing grapes to raisins in Australia.

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
grape, white	berry raisin	28	6.1 10.3	 1.69	DJR 192/00 AUS-DJR192-00-A
grape, white	berry raisin	28	19.3 28.4	 1.47	DJR 192/00 AUS-DJR192-00-B
grape, white	berry raisin	28	2.60 4.1	 1.58	DJR 192/00 AUS-DJR192-00-C
grape, white	berry raisin	28	10.0 14.1	 1.41	DJR 192/00 AUS-DJR192-00-D
grape, red	berry	14 21 28 35	3.7 2.4 2.5 1.5		MWS 450/00 AUS-MWS450-00-A
	raisin	14 21 28 35	13.6 4.6 3.5 2.8	3.68 1.92 1.4 1.87 mean 2.22 max 3.68	

Commodity	Portion analysed	PHI (days)	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
grape, red	berry	14 21 28 35	4.3 4.8 5.7 4.9		MWS 450/00 AUS-MWS450-00-B
	raisin	14 21 28 35	18.2 5.2 6.0 7.2	4.23 1.08 1.05 1.47 mean 1.96 max 4.23	
grape, red	berry	14 21 28 35	2.7 3.1 3.8 2.3		MWS 450/00 AUS-MWS450-00-C
	raisin	14 21 28 35	8.5 3.6 3.8 2.6	3.15 1.16 1.0 1.13 mean 1.61 max 3.15	
grape, red	berry	14 21 28 35	4.9 4.5 4.8 2.1		MWS 450/00 AUS-MWS450-00-D
	raisin	14 21 28 35	13.9 13.3 7.4 6.3	2.84 2.96 1.54 3.0 mean 2.59 max 3.0	

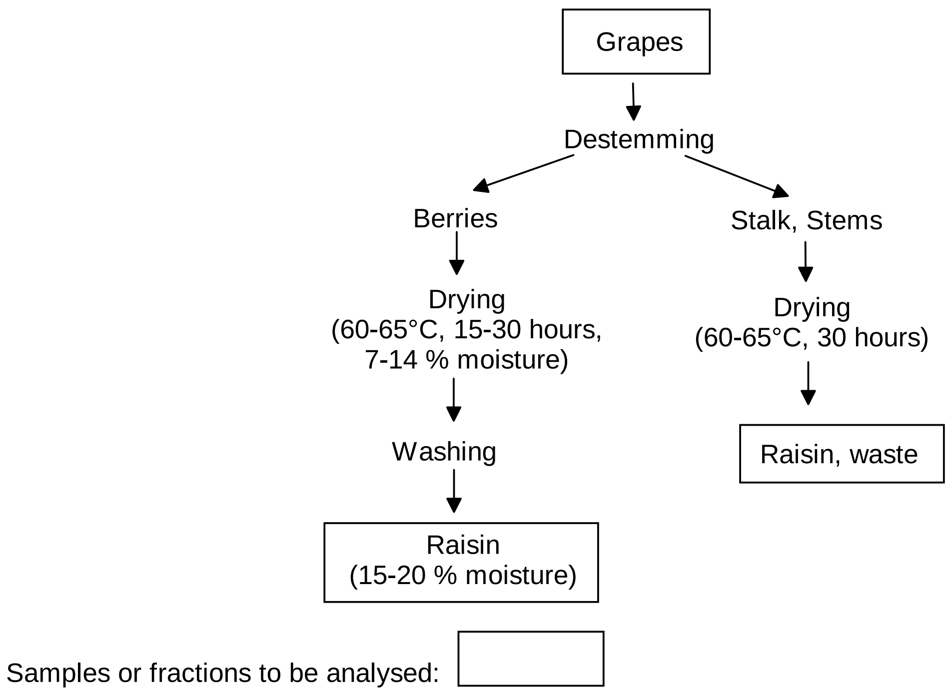


Figure 14. Flow diagram describing the preparation of raisins from grapes.

Strawberries

The effect of processing on fenhexamid residues in strawberries was examined in 1995 (RA-3053/95, Nuesslein and Walz-Tylla, 1996). The field part was conducted in Italy. Fenhexamid was applied four times at an application rate of 1.5 kg/ha product (0.75 kg ai/ha, 0.075% w/v). Strawberries were collected one day after the final application. Harvested fruit was processed into washed fruit and jam using procedures which simulated commercial practice (see Figure 15). First, any damaged fruit were discarded. The strawberries were then washed in standing water using slow movement and then cut into small pieces for analysis as washed fruit. All results are summarised in Table 53. The abbreviation PF is used for processing factor.

Table 53. Results from the processing study on strawberry.

Country	Commodity	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
Italy	strawberry	fruit	0.66		RA-3053/95
		fruit, washed	0.19	0.29	0037-95
		jam	0.19	0.29	

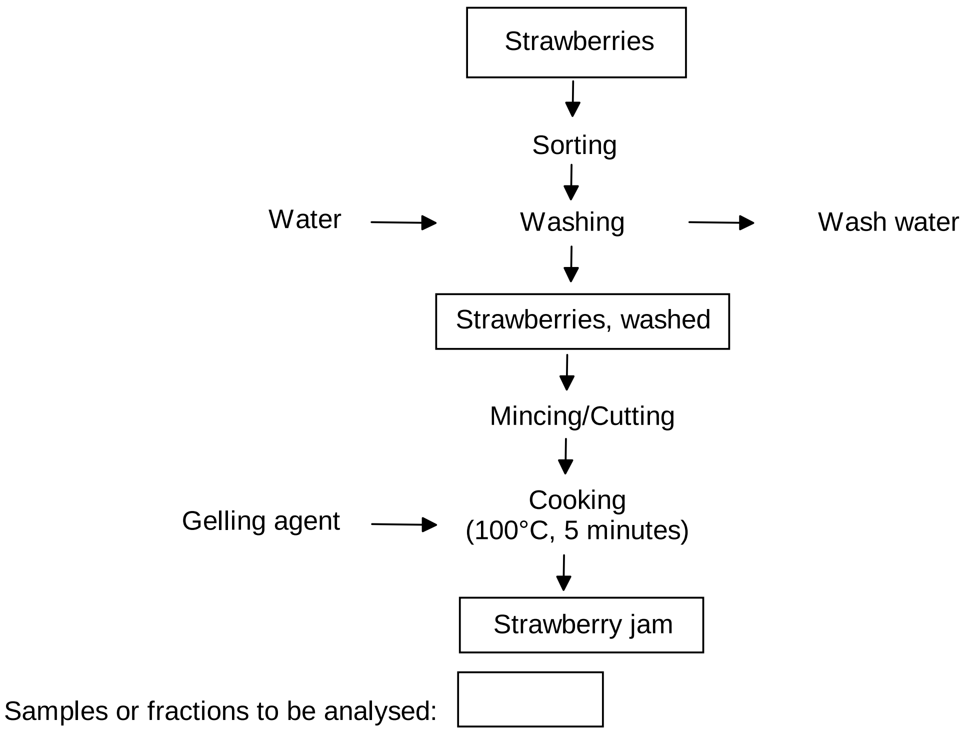


Figure 15. Flow diagram describing the preparation of strawberry jam.

Tomato

Supervised residue trials were conducted during 1996 in glasshouses in Germany and Belgium (RA-3035/96, Nuesslein and Walz-Tylla, 1996). Fenhexamid WG 50 formulation was applied three times at 0.75 kg ai/ha in the German trial and at 1.5 kg ai/ha in the Belgium trial. Samples for processing and residue analysis were harvested one day after the final application. The tomatoes were washed and processed into juice, paste and preserves. Washing was done using domestic practice (see Figure 16), whereas the production of juice, paste and preserve simulated industrial procedures but on a laboratory scale (see Figures 17, 18). A summary of the results is given in Table 54. The abbreviation PF is used for processing factor.

Table 54. Results from processing studies on tomato.

Country	Portion analysed	Fenhexamid residues (mg/kg)	PF	Study No. Trial SubID
Belgium	fruit	0.96		RA-3035/96
	fruit, washed	0.79	0.82	0046-96
	juice	0.29	0.30	
	paste	6.0	6.25	
	preserve	0.29	0.30	
Germany	fruit	0.34		RA-3035/96
	fruit, washed	0.17	0.5	0461-96
	juice	0.13	0.38	
	paste	1.4	4.12	
	preserve	0.1	0.29	

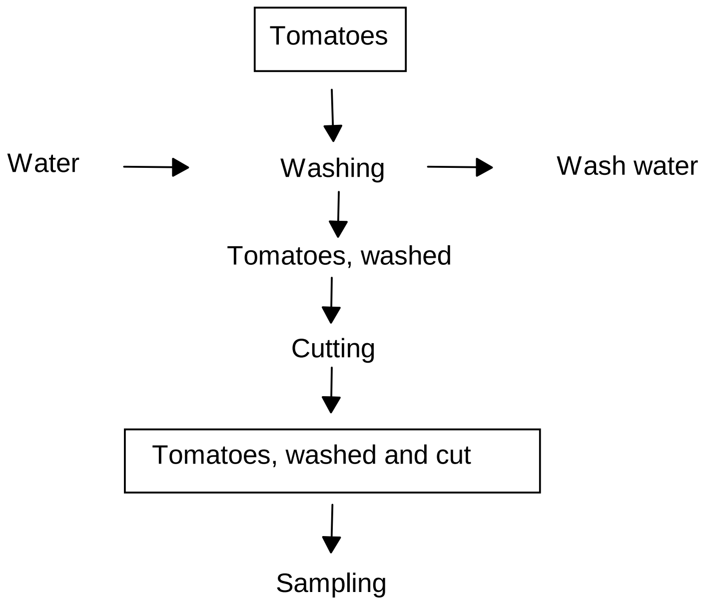


Figure 16. Flow diagram describing the preparation of washed tomatoes.

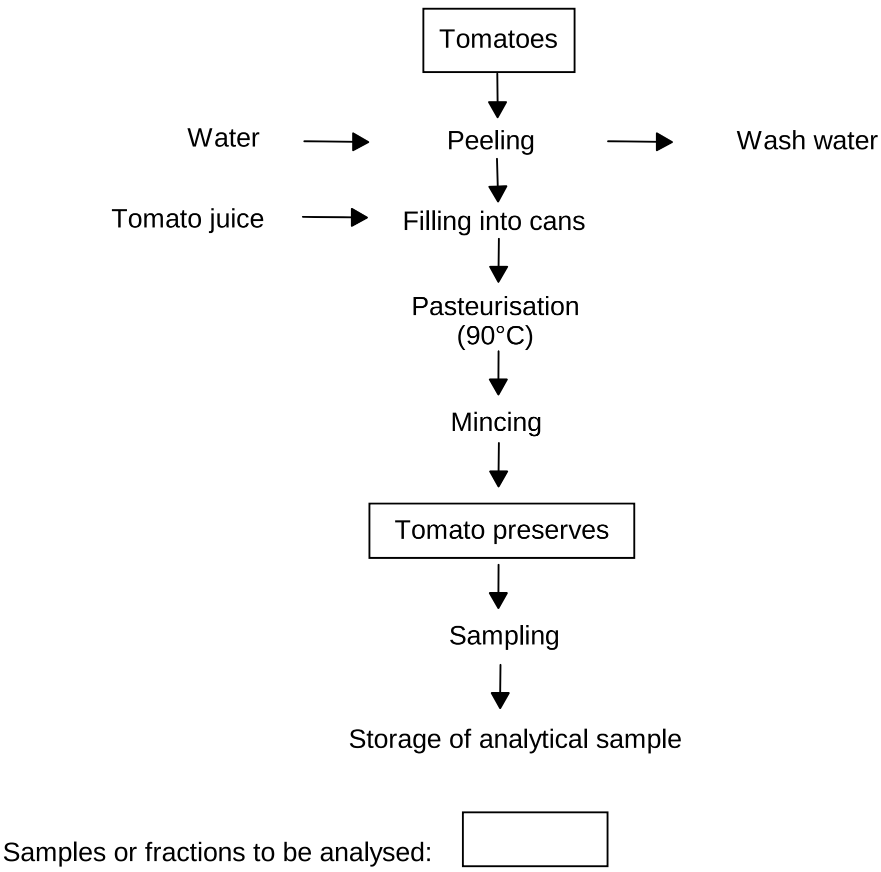


Figure 17. Flow diagram describing the preparation of tomato preserves.

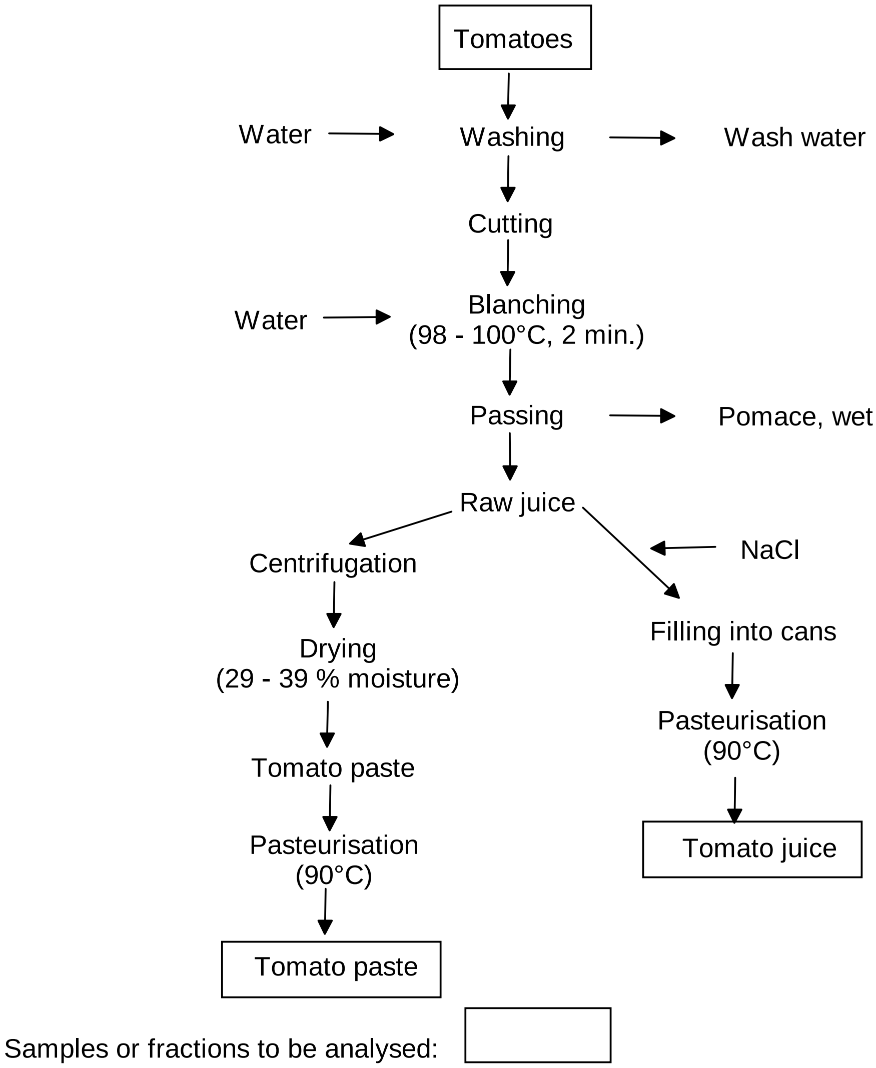


Figure 18. Flow diagram describing the preparation of tomato juice and paste.

Lettuce

In 2000 and 2001, two “pseudo-processing” studies were performed with fenhexamid on lettuce (RA-3038/00, Nuesslein, 2001; RA-3067/01, Nuesslein, 2002). Fenhexamid was applied according to the proposed use pattern in two field trials (2 × 0.75 kg ai/ha, 0.125% w/v), see Table 42, trials RA-2038/00 0266-00 and RA-2067/01 0165-01. Duplicate samples were taken on day 3 (proposed PHI), each set being processed separately. Residues were determined in the RAC and in a variety of "processed" products designed to represent typical stages in the handling of the RAC, such as washing and after removal of outer wrapper leaves. The trials were designed to determine the level of residues on the outer leaves as well as any effect of washing on residues.

Processing was conducted using common household practices. "Outer leaves" were removed from the heads and "inner heads" were retained. From "inner heads" stalks and waste were then removed to provide "inner leaves", which were either analysed unwashed, or washed, yielding "washed inner leaves" and "washing water" for analysis.

The processing procedures used for the preparation of the various lettuce products described above are shown in Figure 19. The residues of fenhexamid are concentrated on the outer leaves and washing was found to significantly reduce the magnitude of residues on the leaves. All results are shown in detail in Table 55.

Table 55. Results from processing studies on lettuce.

Portion analysed	Trial A fenhexamid residues		Trial B fenhexamid residues		Factor mean	Study No. Trial SubID
	mg/kg	factor A	mg/kg	factor B		
head	1.3		1.6			RA-3038/00[1]
head, inner parts	1.8	1.38	1.5	0.938	1.2	2600-00
leaf, outer	4.4	3.38	4.2	2.63	3.0	A, B
leaf, inner	1.5	1.15	1.7	1.06	1.1	
leaf, inner, washed	0.38	0.29	0.35	0.219	0.25	
washing water	0.32	0.25	0.27	0.169	0.21	
head	6.0		4.9			RA-3067/01[1]
head, inner parts	2.6	0.433	2.6	0.531	0.48	0165-01
leaf, outer	6.9	1.15	11.0	2.24	1.7	A, B
leaf, inner	3.5	0.583	3.1	0.633	0.61	
leaf, inner, washed	0.79	0.132	0.99	0.202	0.17	
washing water	0.91	0.152	0.84	0.171	0.16	

[1] Two independent samples which were processed separately

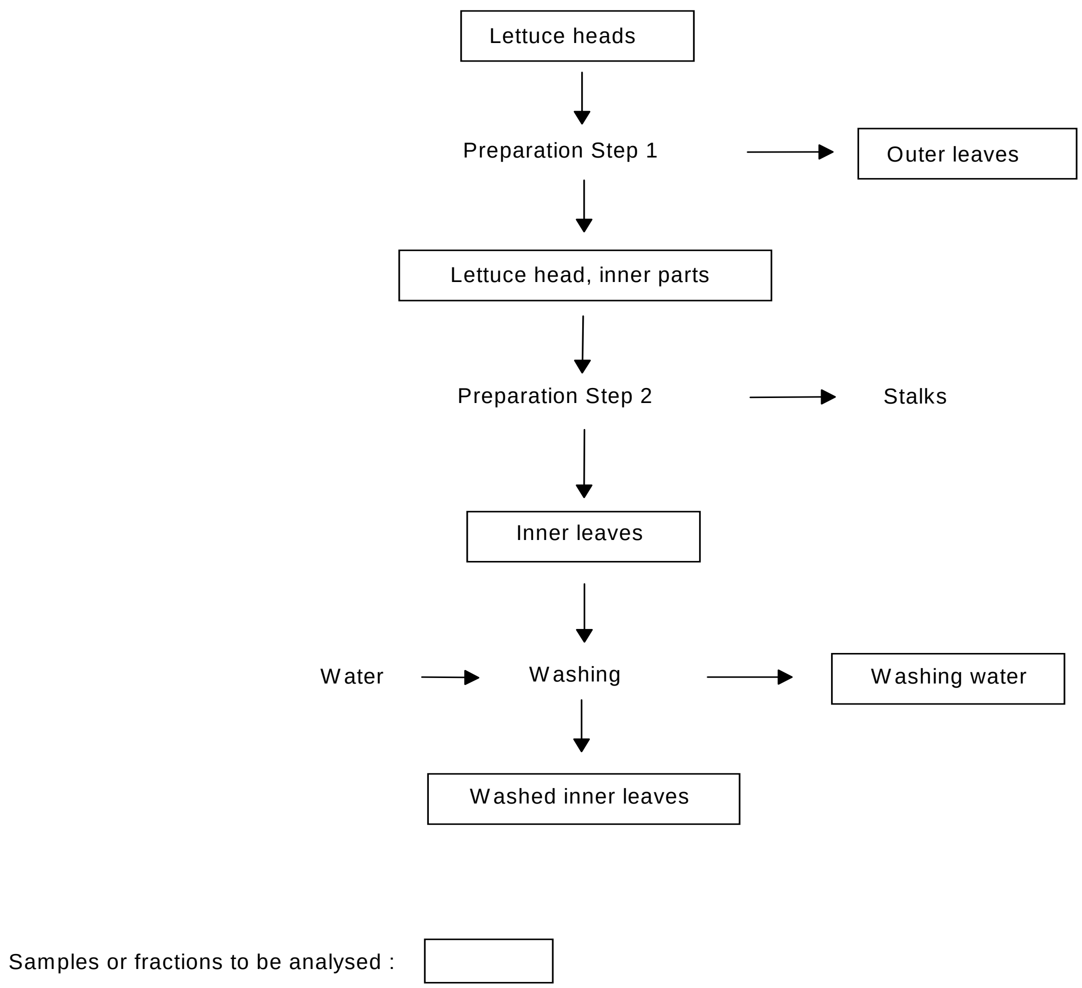


Figure 19. Flow diagram describing the preparation of lettuce processing products.

RESIDUES IN ANIMAL COMMODITIES

No feeding study submitted.

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

No data available.

NATIONAL MAXIMUM RESIDUE LIMITS

Information on national maximum residue limits were received for Australia, Austria, Belgium, Canada, Czech Republic, Denmark, European Union, France, Germany, Greece, Israel, Italy, Japan, The Netherlands, New Zealand, Spain, South Africa, South Korea, Sweden, Switzerland, United Kingdom and the USA. In all countries, the residue for compliance with MRLs is defined as fenhexamid.

APPRAISAL

Residue and analytical aspects of fenhexamid, or 2′,3′-dichloro-4′-hydroxy-1-methylcyclohexane-carboxanilide, were considered for the first time by the present Meeting.

Fenhexamid is a protectant fungicide and has registered uses in many countries on horticultural crops and vegetables. It inhibits spore germ tube development and hyphal growth.

IUPAC: 2′,3′-dichloro-4′-hydroxy-1-methylcyclohexanecarboxanilide

CAS: N-(2,3-dichloro-4-hydroxyphenyl)-1-methylcyclohexane- carboxamide

The Meeting received information on fenhexamid metabolism and environmental fate, methods of residue analysis, freezer storage stability, national registered use patterns, supervised residue trials, fate of residues in processing, and national MRLs. Australia and the Netherlands submitted GAP information and labels to support MRLs for fenhexamid.

Animal metabolism

The metabolism of fenhexamid was investigated in rats and goats.

One lactating goat was dosed with [phenyl-UL-^{14}C]fenhexamid at a rate of 10 mg/kg body weight (equivalent to 133 ppm in the feed) for three consecutive days. Approximately 63.5% of the total radioactivity administered (about 99% of the recovered radioactivity) was excreted within 54 h after the first administration. The major excretory pathway was via the faeces (39% of the applied radioactivity), followed by excretion via the urine (25%). A low amount (0.03%) was secreted with the milk. At sacrifice 6 h after the last dosage, the total radioactive residues (TRR) in the edible tissues and organs accounted for 0.58% of the administrated radioactivity. The major portion and the highest equivalent concentration were observed in the liver (0.47% of the administrated radioactivity).

The metabolism of fenhexamid in the goat is comparable to the metabolism in the rat. Sulfate conjugates of hydroxy-fenhexamid were not observed in the goat but in the rat.

The unchanged parent compound was found in all goat tissue samples and ranged from 19% of the TRR (equiv. to 0.007 mg/kg) in muscle, 21% (equiv. to 0.69 mg/kg) in kidney, 36% (equiv. to 0.031 mg/kg) in fat to 54% (equiv. to 2.5 mg/kg) in liver. No fenhexamid was detected in milk.

4-Hydroxy-fenhexamid was identified as a main metabolite in the goat tissues ranging from 18 to 31.5% of the respective TRR (equiv. to 0.007 mg/kg in muscle and 0.027 mg/kg in fat). The glucuronide of fenhexamid was the predominant metabolite in milk (71% of the TRR, equiv. to 0.13 mg/kg) and a main component in tissues, except liver (9.0 of the TRR in fat, equiv. to 0.008 mg/kg; 24% in muscle, equiv. to 0.009 mg/kg and 31% in kidney, equiv. to 1.01 mg/kg). In addition, the glucuronide of 4-hydroxy-fenhexamid was detected in kidney (9.4% of the TRR, equiv. to 0.31 mg/kg).

The Meeting concluded that the elimination of fenhexamid in the goat was rapid via conjugation of the phenyl hydroxyl group and hydroxylation of the cyclohexylring.

Plant metabolism

The behaviour and metabolism of [phenyl-UL-^{14}C]fenhexamid was investigated under simulated field conditions in grapes, apples, tomatoes, lettuce and field peas using spray application. In addition, separate translocation experiments were carried out for grapes, apples and tomatoes to investigate the possible occurrence of the metabolite 2,3-dichloro-4-hydroxyaniline (DCHA).

The studies demonstrated that the metabolic pathway of fenhexamid is similar in all crops investigated. The rate of degradation in/on plants is quite low and the parent compound was always the major component.

The metabolism of fenhexamid proceeded along two pathways:

conjugation (glucoside) of the parent compound at the phenolic hydroxyl group

hydroxylation at the 2- and 4-position in the cyclohexyl ring followed by conjugation of the hydroxyl group.

These two metabolic routes occurred only to a limited extent. In the different crop studies it was shown that the majority of radioactivity remained on the surface of the fruits as unchanged parent compound, approaching 90% of the TRR. The sum of all metabolites did not exceed 20% of the TRR, and no single metabolite was present at above 3.2%. Most of the metabolites identified were hydroxy-derivatives of fenhexamid. No DCHA was detected.

Translocation experiments found that fenhexamid was not systemic.

The Meeting concluded that fenhexamid is stable when used as a foliar spray on various food crop plants. There was no appreciable metabolism or degradation under typical GAP conditions.

Nature of residues after hydrolysis under processing conditions

The Meeting received information on the fate and nature of [phenyl-UL-^{14}C]fenhexamid residues during different conditions of hydrolysis (pH 4–6, temperature 90–120°C, time 20–60 min). The results showed that the parent compound is not significantly affected by these processes. At the end of the study the content of fenhexamid was in the range of 96% to 100% of applied radioactivity.

The Meeting concluded that it is unlikely that processing will affect the nature of fenhexamid residue.

Environmental fate

Because fenhexamid is used for foliar spray treatment, only studies of hydrolysis, photolysis and rotational crops were considered.

Fenhexamid is hydrolytically stable at pH 5 - 9. No formation of hydrolysis products was observed. Considering the degree of hydrolytic stability determined under environmental pH and temperature conditions, it is not expected that hydrolytic processes would contribute to the degradation of fenhexamid in the environment. However, when irridated with a xenon lamp, fenhexamid underwent photolysis with a half life equivalent to 1.8 h at the equivalent of 40° latitude midday midsummer solar light. Therefore, it can be concluded that while fenhexamid is stable at a range of environmental pHs, rapid photochemical degradation may occur.

The metabolism of [phenyl-UL-^{14}C]fenhexamid was investigated in the rotational crops wheat, Swiss chard and turnips from three consecutive rotations. The TRRs decreased significantly from the first to the third rotation in all raw agricultural commodities. The maximum TRR (0.73 mg/kg) was observed in the first rotation for Swiss chard sown 30 days after soil application. The TRRs of the second rotation were all ≤ 0.1 mg/kg. The TRRs of the third rotation ranged from ≤ 0.01 mg/kg (turnip roots) to 0.08 mg/kg (wheat straw).

The Meeting concluded that residues, from the use of fenhexamid, in succeeding crops are not to be expected.

Methods of analysis

The Meeting received descriptions and validation data for analytical methods for fenhexamid in plant and animal matrices. Plant matrices are extracted with acetone from samples with high water content and with a mixture of water/acetone from dry samples and cleaned up by solid phase extraction. The residues are detected with HPLC/electrochemical detection or HPLC/MS/MS and generally achieved LOQs of 0.02–0.05 mg/kg. The recoveries were in the range of 63–120%.

Animal matrices were extracted with acetonitrile or n-hexane and cleaned-up by liquid-liquid partitioning and finally by column chromatography on a silica gel column. The residues were detected with HPLC-UV and achieve LOQs between 0.01 mg/kg (milk) and 0.05 mg/kg (egg, meat and fat). The recoveries were in the range of 67–101%.

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of fenhexamid in various plant matrices at freezer temperatures for 5.5–17 months. Fenhexamid residues were generally stable (less than 30% disappearance) for the duration of the testing.

Definition of the residue

The behaviour and metabolism of fenhexamid was investigated in a number of fruiting crops (grape, tomato and apple), leafy crops (lettuce) and oil seed/pulses (peas). The studies demonstrated that the metabolic pathway of fenhexamid is similar in all crops investigated. The rate of degradation on plants is quite low and the parent compound was always the major component. The sum of all metabolites does not exceed 20% of the radioactive residue, and no single metabolite was present at above 3.2%. The residue definition for plants is therefore parent compound only.

Parent fenhexamid is in concentrations from 19 to 54% of TRR detectable in goat tissues where it is hydroxylated to derivatives that form glucuronic acid conjugates. The log P_{OW} of fenhexamid is 3.6 suggesting that it is fat-soluble. This is confirmed by the goat metabolism study which shows a higher residue concentration in fat than in muscle.

The Meeting agreed that the residue definition for compliance with MRLs and for estimation of dietary intake should be fenhexamid per se. The definition applies to plant and animal commodities.

The residue is fat-soluble.

Results of supervised trials on crops

The Meeting received supervised trials data on citrus fruit (oranges, mandarins and lemons), stone fruit (cherries, peaches and nectarines), berries (grapes, strawberries, black currants, blueberries, raspberries and blackberries), kiwi, cucumbers, tomatoes, sweet peppers, lettuce and almonds.

Citrus fruits

The use of fenhexamid as a foliar spray is registered in Japan (GAP of 1 – 2 applications at rates of 0.03–0.05 kg ai/hL, PHI 14 days).

Seven field trials (reversed decline studies) were conducted in Japan between 1995 and 1997 with fenhexamid on citrus (orange 2 trials, mandarin 2 trials, lemon 3 trials). Fenhexamid was applied twice (orange, lemon) or three times (mandarin) at rates of 0.05 kg ai/hL. The spray interval was 7 – 8 days. The residues in whole fruits were

Oranges: 0.76, 1.5 mg/kg

Mandarins: 2.2, 2.2 mg/kg

Lemons: 0.10, 0.17, 0.91 mg/kg.

The residues in pulp were

Oranges: 0.04, 0.05 mg/kg

Mandarins: 0.08, 0.11 mg/kg

The Meeting concluded that the data, in particular on oranges and mandarins, were not sufficient to estimate a maximum residue level and STMR for residues in citrus fruits as a major crop.

Stone fruits

Supervised residue trials were presented on cherries, peaches, nectarines and plums. In some trials the residue concentrations were calculated on whole fruit basis and in other cases for the edible portion. The Meeting agreed to use both kinds of data to estimate maximum residue levels and STMRs because the ratio of residue/weight of flesh and whole fruit differed by not more than 20%.

Cherries

Fenhexamid is registered for use on cherries in some European countries as pre harvest foliar spray treatment. Residue trials were carried out in Germany, France and Italy. The German GAP is 1 – 3 applications at a rate of 0.25 kg ai/ha per m crown height (equiv. to 0.75 kg ai/ha for a tree with a crown of 3 m) with a 3-days PHI. The residues in whole fruits were 0.68, 0.82, 0.87, 1.0, 1.2, 1.6, 2.1 and 2.8 mg/kg in six German and two French (North) trials on sour and sweet cherries matching the German GAP.

The Italian GAP (1- 4 applications at 0.75 kg ai/ha, 1 day PHI) is matched by two trials with residues in whole fruits of 0.63 and 0.91 mg/kg.

In the USA fenhexamid may be used as foliar spray treatment on cherries at 0.84 kg ai/ha with a 0-day PHI after up to 4 applications. In trials matching GAP the fenhexamid residues in the edible portion in ranked order were 1.1, 1.1, 1.1, 1.5, 1.9 and 4.7 mg/kg.

Fenhexamid is also approved in the US as a post harvest dip or spray to cherries at a rate of 0.34 kg ai in 378.5 L water to 11,300 kg of fruit (equiv. to 0.09 kg ai/hL or 3 g ai/100 kg fruit). In two trials matching GAP conditions residues found were 1.9 and 2.4 mg/kg. Two further trials were carried out with two pre harvest spray applications of 0.85 kg ai/ha followed by one post harvest treatment of 0.09 kg ai/hL. The residues found in the edible portion were 2.3 and 3.7 mg/kg.

The Meeting considered that the data from foliar spray and post harvest use are from the same pool and decided to combine all cherry residue data. The combined results (n = 20) were 0.63, 0.68, 0.82, 0.87, 0.91, 1.0, 1.1, 1.1, 1.1, 1.2, 1.5, 1.6, 1.9, 1.9, 2.1, 2.3, 2.4, 2.8, 3.7 and 4.7 mg/kg.

The Meeting estimated a maximum residue level of 7 mg/kg and an STMR of 1.35 mg/kg for residues of fenhexamid in cherries.

Peaches and nectarines

Fenhexamid is registered for use on peaches and nectarines in a number of European countries as a pre harvest foliar treatment. Residue trials were carried out in Spain and Italy. The Italian GAP (maximum of 4 applications at 0.75 kg ai/ha, with a 1 day PHI) was matched by two Spanish trials each on nectarines and peaches with residues found of 0.18, 0.36, 0.36 and 0.44 mg/kg in the whole fruit. The edible portion was analysed in two trials only with residues of 0.22 and 0.39 mg/kg found.

In the USA fenhexamid is approved for use at 0.84 kg ai/ha with a 0-day PHI after four foliar spray applications. In trials on peaches matching GAP, fenhexamid residues in the edible portion were found to be 0.62, 0.66, 0.69, 1.2, 1.3, 1.3, 1.4, 1.9 and 2.1 mg/kg.

Fenhexamid is also approved in the USA as a post harvest dip or spray at 0.34 kg ai in 378.5 L water to 90,700 kg of fruit (equiv. to 0.09 kg ai/hL or 0.37 g ai/100 kg fruit). In six peach trials matching GAP conditions the residues in the edible portion were 0.65, 1.6, 2.9, 4.1, 4.6 and 5.9 mg/kg. Six further trials were carried out with two pre harvest spray applications of 0.84 kg/ha followed by one post harvest treatment at 0.09 kg ai/hL. Residues found in the edible portion were 0.63, 2.8, 3.8, 3.9, 4.8 and 5.7 mg/kg. The combined results were 0.63, 0.65, 1.6, 2.8, 2.9, 3.8, 3.9, 4.1, 4.6, 4.8, 5.7 and 5.9 mg/kg. These residues were considered to belong to a different population from those resulting from foliar spray use.

The Meeting estimated a maximum residue level of 10 mg/kg and an STMR of 3.85 mg/kg on the basis of post harvest treatment use for fenhexamid residues in peaches and nectarines.

Plums

Fenhexamid is registered for the use on plums in some European countries as pre-harvest foliar treatment. Residue trials were carried out in Germany, UK, the Netherlands, France and Italy. The German GAP consists of a maximum of 3 applications at a rate of 0.25 kg ai/ha per metre of crown height (equiv. to 0.75 kg ai/ha for a 3 m tree) with a three day PHI. In four German, one French (North), two UK and one Dutch trial on plums, matching the German GAP, residues found in the whole fruit were 0.08, 0.14, 0.31, 0.31, 0.37, 0.39, 0.66 and 0.79 mg/kg.

The Italian GAP (maximum of four applications at 0.75 kg ai/ha, with a one day PHI) is matched by two French (South) trials and one Italian trial, residues found in the whole fruit were < 0.05, 0.14 and 0.37 mg/kg.

In the USA fenhexamid may be used on plums at 0.84 kg ai/ha with a 0-day PHI after 4 foliar applications. In trials matching GAP conditions the fenhexamid residues in the edible portion were < 0.05, 0.06, 0.06, 0.06, 0.06, 0.15, 0.27, 0.33 mg/kg.

All results from pre-harvest foliar treatments, in ranked order were: < 0.05, < 0.05, 0.06, 0.06, 0.06, 0.06, 0.08, 0.14, 0.14, 0.15, 0.27, 0.31, 0.31, 0.33, 0.37, 0.37, 0.39, 0.66 and 0.79 mg/kg.

In the USA fenhexamid is also registered for post harvest use as dip or spray in plums at a rate of 0.34 kg ai in 378.5 L of water to 90,700 kg of fruit (equiv. to 0.09 kg ai/hL or 0.37 g ai/100 kg fruit). In four trials matching GAP the residues in the edible portion were 0.23, 0.34, 0.38 and 0.65 mg/kg. Four further trials were carried out with two pre harvest spray applications of 0.84 kg ai/ha followed by one post harvest treatment with 0.09 kg ai/hL. The residues in the edible portion were 0.33, 0.35, 0.37 and 0.60 mg/kg. The combined residues were 0.23, 0.33, 0.34, 0.35, 0.37, 0.38, 0.60 and 0.65 mg/kg.

The Meeting decided to combine all plum residue data. The combined results (n = 27) were < 0.05, < 0.05, 0.06, 0.06, 0.06, 0.06, 0.08, 0.14, 0.14, 0.15, 0.23, 0.27, 0.31, 0.31, 0.33, 0.33, 0.34, 0.35, 0.37, 0.37, 0.37, 0.38, 0.39, 0.60, 0.65, 0.66 and 0.79 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.31 mg/kg for residues of fenhexamid in plums (including prunes).

Apricots

In Italy, Switzerland and the USA the approved use patterns for apricots is identical to that for cherries, peaches and plums. The Meeting agreed to extrapolate from cherries, peaches and plums to apricot. The data on cherries (STMR 1.35 mg/kg), peaches (STMR 3.85 mg/kg) and plums (STMR 0.31 mg/kg) belonged to different populations and could not be combined. Therefore, the extrapolation is based on the peaches data set with the highest STMR.

The Meeting estimated a maximum residue level of 10 mg/kg and an STMR of 3.85 mg/kg for residues of fenhexamid in apricots.

Grapes

The use of fenhexamid in grapes is registered in a number of countries in Europe, North America (Canada, USA), Africa (South Africa), Asia (Japan, South Korea), Australia and New Zealand. Trials on grapes were conducted in Australia, Canada, France, Germany, Japan, Italy, Spain, Portugal, South Africa and the USA.

In the trials grape bunches were the main commodity analysed. However, the portion of the Codex commodity to which the MRL applies and which should be analysed is the "whole commodity after removal of caps and stems." The Meeting therefore decided to use available residue data only from berries/fruits, to estimate the MRL and STMR for grapes.

The highest GAP for northern Europe corresponds to a rate of up to 0.8 kg ai/ha applied up to two times with a PHI of 21 days (Austria, Germany) or a rate of up to 0.75 kg ai/ha applied once with a PHI of 14 days (France). Six trials were conducted using different grape varieties during 1995 and 1998 in Germany (4 trials) and northern France (2 trials). The residues found in berries, 21 days after two applications, were 0.25, 0.27, 0.35, 0.35, 0.44 and 0.47 mg/kg.

The highest GAP for southern Europe corresponds to a rate of up to 0.75 kg ai/ha applied up to two times with a PHI of 7 days (Italy), or up to 0.5 kg ai/ha applied up to 3 times with a PHI of 7 days (Romania). In nine trials from Spain, Italy, Portugal and France (South) matching Italian GAP residues found in berries were 0.37, 0.39, 0.45, 0.47, 0.78, 0.96, 1.1, 1.4 and 1.6 mg/kg.

In two trials from Portugal and Italy fenhexamid was applied 3 times at a rate of 0.5 kg ai/ha and a PHI of 7 days, matching Romanian GAP. The residues in berries were 0.51 and 0.75 mg/kg.

The Meeting considered that the data from northern and southern Europe are from the same population and combined them, resulting in the following ranked order of concentrations in berries of 0.25, 0.27, 0.35, 0.35, 0.37, 0.39, 0.44, 0.45, 0.47, 0.47, 0.51, 0.75, 0.78, 0.96, 1.1, 1.4 and 1.6 mg/kg.

In South Africa fenhexamid is approved for use in table grapes with a maximum of three applications at a rate of 0.038 kg ai/hL with a 3 days PHI. In the trials four to five applications were made rather than three. The residues in the grape bunches were 0.52, 0.54, 1.1, 1.3 and 2.4 mg/kg. Because no berries were analysed, the trials were not included into the evaluation.

In the USA, fenhexamid is approved for use up to 3 times at a rate of 0.56 kg ai/ha with a 0 day PHI. In seven Canadian and 15 US trials matching US GAP fenhexamid residues in grape bunches were 0.55, 0.62, 0.71, 0.78, 0.87, 0.91, 0.97, 1.0, 1.1, 1.1, 1.1, 1.2, 1.2, 1.3, 1.4, 1.6, 1.6, 1.8, 1.9, 2.1, 2.2 and 2.8 mg/kg. Because no berries were analysed, the trials were not included into the evaluation.

In Australia, fenhexamid is used on grapes with a maximum of 2 applications at rate of 0.05 kg ai/hL (high volume spray) or 0.25 kg ai/hL (low volume spray) with a 21 days PHI. In five trials matching GAP conditions fenhexamid residues were 1.5, 2.5, 3.5, 4.7 and 6.1 mg/kg in berries.

In Japan, fenhexamid is registered for up to 2 applications at a rate of 0.05 kg ai/hL and a 14 day PHI. Four outdoor and two indoor trials were conducted that matched GAP. The residues in the fruit were 4.3, 6.3, 6.7 and 11 mg/kg in the outdoor trials and 0.14 and 3.2 mg/kg in the indoor trials.

The Meeting compared the data sets from Australia and Japan using the Mann-Whitney U-test (see *FAO Manual*, p. 73) and decided that they belonged to the same population and could be combined. The combined Australian and Japanese residues were 0.14, 1.5, 2.5, 3.2, 3.5, 4.3, 4.7, 6.1, 6.3, 6.7 and 11 mg/kg.

The Meeting considered that the data sets from Australia/Japan and from Europe were from different populations. The Meeting therefore estimated a maximum residue level of 15 mg/kg and an STMR of 4.3 mg/kg for residues in grapes, on the basis of Japanese and Australian data.

Strawberries

A total of 49 trials were conducted with fenhexamid in strawberries in North America, Asia, Australia, northern and southern Europe.

The highest GAP for northern Europe (outdoor) corresponded to a maximum of 3 applications at a rate of 1 kg ai/ha with a PHI of 3 days (Austria). Eight field trials were conducted in northern Europe. The fenhexamid residues found were 0.57, 0.70, 0.78, 0.81, 1.1, 1.2, 1.2 and 1.9 mg/kg.

The highest GAP for southern Europe (outdoor) corresponded to a maximum of 4 applications at a rate of 0.75 kg ai/ha with a PHI of one day (Spain). Eight field trials were conducted in southern Europe. The fenhexamid residues found were 0.48, 0.66, 0.74, 1.0, 1.1, 1.1, 1.3 and 1.5 mg/kg.

Fenhexamid is registered in Italy for indoor (greenhouse) use on strawberries at a rate of 0.75 kg ai/ha with a 1 day PHI but with no apparent restriction on the number of applications indicated. A spray interval of 7 – 10 days is recommended. Four indoor trials from Italy, with 4 applications at 0.75 kg ai/ha, were considered to match GAP and showed residues of 0.71, 0.81, 1.1 and 1.7 mg/kg.

The US use pattern on strawberries allows fenhexamid to be sprayed a maximum of 4 times at a rate of 0.84 kg ai/ha with a PHI of 0 days. In 14 trials matching GAP conditions residues found of fenhexamid were 0.35, 0.38, 0.42, 0.49, 0.57, 0.67, 0.97, 1.1, 1.2, 1.2, 1.3, 2.0, 2.1 and 2.3 mg/kg.

Data from two indoor trials were submitted from Japan, in which fenhexamid was applied three times at a rate of 0.05 kg ai/hL. It was decided that the data could not be used for evaluation as the Japanese and Korean GAP specified only outdoor use.

Six further outdoor trials studies were submitted from Australia where five applications were made at rates of 0.4 – 0.56 kg ai/ha with a PHI of 0 days. The residues found were 0.53, 0.54, 2.7, 3.9, 5.6 and 5.9 mg/kg.

Based on the Australian data, the Meeting estimated a maximum residue level of 10 mg/kg and an STMR of 3.3 mg/kg for residues in strawberries.

Blueberries and black currants

Residue data was received for blueberries and black currants and were evaluated together.

The use of fenhexamid in bilberry and similar berries (incl. blueberry) is registered in the USA with 1 – 4 spray applications of 0.84 kg ai/ha and a 0-day PHI. Eight residue trials from six US states on blue berry complied with GAP. At the day of treatment, the concentrations of residues were: 1.0, 1.2, 1.4, 1.6, 1.7, 2.6, 2.8 and 2.9 mg/kg.

In Germany and Austria, the GAP for berries (except grapes and strawberries) includes 1- 4 treatments of 1 kg ai/ha and a 7-day PHI. A total of 8 residue trials were performed in Germany and the UK with 4 x 1 kg ai/ha, 0.2 kg ai/hL on black currants. With a 7-day PHI, the fenhexamid residues were: 0.93, 1.0, 1.2, 1.6, 1.7, 1.7, 1.8 and 2.1 mg/kg.

The Meeting noted that the data on blueberries and black currants were similar and could be combined for mutual support. The combined residues were, in rank order: 0.93, 1.0, 1.0, 1.2, 1.2, 1.4, 1.6, 1.6, 1.7, 1.7, 1.7, 1.8, 2.1, 2.6, 2.8 and 2.9 mg/kg.

The Meeting agreed to extrapolate from blueberries and black currants to other bush type berries and estimated a maximum residue level of 5 mg/kg and an STMR of 1.65 mg/kg for residues in bilberries, blueberries, currants (black, red, white), elderberries, gooseberries and juneberries.

Raspberries and blackberries

In Germany and Austria, the GAP for berries (except grapes and strawberries) includes 1- 4 treatments of 1 kg ai/ha and a 7-day PHI. Five residue trials were performed in the UK and 2 in Germany with 4 × 1 kg ai/ha on raspberries. With a 7-day PHI, the fenhexamid residues were: 0.9, 1.1, 1.4, 1.5, 1.6, 2.0 and 4.0 mg/kg.

In the USA, fenhexamid is registered in blackberry and raspberry with 1 – 4 spray applications of 0.84 kg ai/ha and a 0-day PHI. A total of 6 GAP residue trials were performed with foliar spray application in North America, one on blackberries and two on raspberries in Canada and three on raspberries in the USA. The application rate was 4 × 0.79 – 0.88 kg ai/ha. The residue concentrations were 0.55, 3.0, 4.0, 5.2, 11 and 11 mg/kg after a 0-day PHI.

The Meeting compared data sets from Europe and the USA by the Mann-Whitney U-test (see *FAO Manual*, p.73) and decided that they belonged to one population and could be combined. The combined residues were, in rank order: 0.55, 0.9, 1.1, 1.4, 1.5, 1.6, 2.0, 3.0, 4.0, 4.0, 5.2, 11 and 11 mg/kg.

The Meeting agreed to extrapolate from raspberries and blackberries to other cane type berries and estimated a maximum residue level and an STMR value for fenhexamid in dewberries (boysenberries, loganberries), raspberries and blackberries of 15 mg/kg and 2.0 mg/kg.

Kiwifruit

Fenhexamid may be used in Europe (Greece and Italy) as post harvest dip or spray with a 0.05 – 0.06% solution on kiwifruit with a 60 day PHI. Four trials were performed in Italy with dipping in a 0.075% solution. The residues were 60 days after treatment in whole fruits 3.5, 4.0, 4.8 and 6.3 mg/kg.

In the USA fenhexamid is registered for post harvest use by 30 s dipping in a solution of 0.09% or as a packing line spray at a rate of 0.37 g ai/100 kg fruits. Three trials were performed with dipping (0.09%) and two with spraying (0.375 g ai/100 kg fruits). The residues were 3.5, 6.3, 6.5, 9.5 and 11 mg/kg.

The Meeting compared both kiwifruit data sets from Europe and the USA by the Mann-Whitney U-test (see *FAO Manual*, p.73) and decided that they belonged to one population and could be combined. The combined residues were, in rank order: 3.5, 3.5, 4.0, 4.8, <u>6.3</u>, 6.3, 6.5, 9.5 and 11 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for fenhexamid in kiwifruit of 15 mg/kg and 6.3 mg/kg.

Cucumber, gherkin and summer squash

The highest GAP for indoor uses in Europe in/on cucumber corresponds to 0.75 kg ai/ha, applied up to 3 times with a PHI of 3 days (Austria) or sprayed at 0.05 kg ai/hL with a PHI of 1 day in the Netherlands, where no maximum number of application is stated. The GAP for Israel is the same as for Austria without specifying the maximum number of applications, but because cucumbers are harvested continuously and spray intervals were 7 days or more it is unlikely that the same fruit received more than 3 applications. The fenhexamid residues in cucumbers from 16 European indoor trials (3 Belgium, 3 German, 1 Dutch, 2 French, 2 Italian, 3 Spanish, 2 Greek) meeting these conditions were 0.10, 0.12, 0.14, 0.14, 0.14, 0.15, 0.16, 0.18, 0.19, 0.19, 0.20, 0.20, 0.21, 0.29, 0.33 and 0.65 mg/kg with a 1-day PHI.

The registered use in The Netherlands on gherkin and summer squash is the same as on cucumber. The Meeting agreed to extrapolate the cucumber values to gherkin and summer squash.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.185 mg/kg for residues in cucumber, gherkin and summer squash.

Tomato

The highest GAP for outdoor and indoor uses in Europe in tomato corresponds to 0.75 kg ai/ha, 0.05 – 0.075 kg ai/hL with a PHI of 1 day (Italy) and spray intervals of 10–14 days, no maximum number of applications is stated.

Seven outdoor trials (4 French, 1 Italian, 2 Portuguese) on tomato matching the GAP with a rate of 3 x 0.75 kg ai/ha were submitted with residues of 0.29, 0.32, 0.34, 0.42, 0.62, 0.63 and 0.93 mg/kg.

A total of 17 tomato residue trials (1 Spain, 2 France, 4 Italy, 4 Germany, 3 Belgium, 1 Greece, 2 Netherlands) were performed indoor according to Italian GAP in Europe in 1995/96/98/99. In each trial, 3 applications (interval 7 days) were made. All applications were carried out approximately at the highest label application rate (0.75 kg ai/ha). At the 1-day PHI, the concentrations of residues were: 0.17, 0.24, 0.24, 0.25, 0.27, 0.32, 0.34, 0.34, 0.39, 0.40, 0.41, 0.42, 0.54, 0.63, 0.72, 0.80 and 0.86 mg/kg.

The Meeting considered that the data from indoor and outdoor trials on tomato are from the same pool and combined them, resulting in a ranked order as follows (n = 24): 0.17, 0.24, 0.24, 0.25, 0.27, 0.29, 0.32, 0.32, 0.34, 0.34, 0.34, <u>0.39</u>, <u>0.40</u>, 0.41, 0.42, 0.42, 0.54, 0.62, 0.63, 0.63, 0.72, 0.80, 0.86 and 0.93 mg/kg.

The Meeting estimated a maximum residue level of 2 mg/kg and an STMR of 0.395 mg/kg for residues of fenhexamid in tomato.

Peppers

The highest GAP for indoor uses in Europe in/on peppers corresponds to 0.75 kg ai/ha, applied up to 3 times with a PHI of 3 days (Austria) or sprayed at 0.05 kg ai/hL with a PHI of 1 day in the Netherlands, where no maximum number of application is stated. The GAP for Israel is the same as for Austria without specifying the maximum number of applications, but because peppers in greenhouse are harvested continuously and spray intervals were 7 days or more it is unlikely that the same fruit received more than 3 applications.

The fenhexamid residues in sweet peppers from 18 European indoor trials (3 Belgium, 3 German, 3 Dutch, 2 French, 4 Italian, 2 Spanish, 1 Portuguese) meeting these conditions were 0.38, 0.41, 0.43, 0.45, 0.48, 0.63, 0.66, 0.67, <u>0.67</u>, <u>0.75</u>, 0.76, 0.84, 0.86, 0.89, 0.90, 0.92, 1.0 and 1.5 mg/kg with a 1-day PHI.

The Meeting agreed to extrapolate from data for sweet pepper on the whole subgroup including chili and sweet peppers and estimated a maximum residue level of 2 mg/kg and an STMR of 0.71 mg/kg for residues of fenhexamid in peppers.

Egg plant

The registered use on egg plant is the same as on tomato and peppers in the Netherlands. The Meeting agreed to extrapolate from tomato and sweet pepper to egg plant. The data on tomato and peppers belonged to different populations and could not be combined. Therefore, the extrapolation based on the sweet pepper data set.

The Meeting estimated a maximum residue level of 2 mg/kg and an STMR of 0.71 mg/kg for residues of fenhexamid in egg plant.

Lettuce

The Austrian use pattern for lettuce grown indoor and outdoor allows fenhexamid to be sprayed 2 times at 0.75 kg ai/ha with a PHI of 7 days.

Eight outdoor trials on <u>head</u> lettuce from northern European countries (3 Germany, 3 Netherlands, 2 UK) matching maximum GAP with a rate of 2 × 0.75 kg ai/ha were submitted with fenhexamid residues at day 7 of 0.10, 0.11, 0.24, 0.30, 0.47, 1.1, 2.0 and 5.3 mg/kg.

Eight further outdoor trials on head and leaf lettuce were carried out in southern Europe (2 Spain, 3 Italy, 2 Portugal, 1 France-South) under the same application conditions. The residues were in <u>head</u> lettuce < 0.05, 0.07, 0.69, 0.84 and 2.0 mg/kg and in <u>leaf</u> lettuce 0.48, 0.94 and 2.7 mg/kg.

Six indoor trials on <u>head</u> lettuce from European countries (4 Germany, 2 Italy) matching maximum GAP with a rate of 2× 0.75 kg ai/ha were submitted with fenhexamid residues at day 7 of

1.3, 2.7, 6.4, 11, 12 and 17 mg/kg. Two further indoor trials on leaf lettuce were carried out under the same application conditions in Italy with residues of 14 and 19 mg/kg at day 7.

The Meeting compared both data sets from indoor and outdoor use by the Mann-Whitney U-test (see FAO Manual, p.73) and decided that they belonged to different populations and could not be combined. The Meeting decided to use the greenhouse lettuce data to support the evaluation.

In summary, fenhexamid residues in lettuce from greenhouse trials in rank order were: 1.3, 2.7, 6.4, 11, 12, 14, 17 and 19 mg/kg.

The Meeting noted that the 24 trials covered 15 varieties of lettuce and decided to make recommendations for both head and leaf lettuce.

Based on the indoor data set, the Meeting estimated a maximum residue level and an STMR value for fenhexamid in head and leaf lettuce of 30 mg/kg and 11.5 mg/kg.

Almonds

Fenhexamid is registered in the USA for use on almonds up to 4 times at 0.84 kg ai/ha up to 4 times at 0.84 kg ai/ha up to 28 days after petal fall.

Five trials on almonds from the USA with 4 treatments at 0.85 kg ai/ha and a 142−173 days PHI matching the GAP for foliar spray up to 28 days after petal fall were reported. The fenhexamid residues in almond nuts without shells were all < 0.02 (5) mg/kg.

The Meeting estimated a maximum residue level and an STMR value for fenhexamid in almonds of 0.02*mg/kg and 0.02 mg/kg.

Almond hulls

From the five trials described above the fenhexamid residues in almond hulls were 0.15, 0.47, 0.54, 0.77 and 1.1 mg/kg (fresh weight).

The Meeting estimated a maximum residue level of 2 mg/kg, a highest residue of 1.2 and an STMR of 0.6 mg/kg on dry weight basis.

Fate of residues during processing

The effect of processing on the level of residues of fenhexamid has been studied in cherries, plums, grapes, strawberries and tomatoes. The processing factors (PF) shown below were calculated.

In Australian grape processing studies, five PF values for juice, wine, wet pomace and raisin could be calculated per trial. In these cases, only the maximum PF per trial was used for the evaluation. The mean PF was calculated from two values, otherwise the median PF was calculated.

Table 56. Calculated processing factors.

RAC	Processed product	No.	PF	Mean/median PF
Cherries	Juice	1	0.02	0.02
	Preserve	2	0.198, 0.27	0.23
Grapes	Juice	16	0.045, < 0.06, < 0.17, 0.29, 0.39, 0.44, 0.49, 0.51, 0.51, 0.55, 0.66, 0.68, 0.78, 0.79, 0.80, 1.35	0.51
	Must	6	0.19, 0.24, 0.40, 0.43, 0.53, 0.9	0.415
	Wine	19	0.20, 0.20, 0.20, 0.21, 0.22, 0.23, 0.23, 0.24, 0.27, 0.28, 0.29, 0.31, 0.34, 0.40, 0.42, 0.46, 0.50, 0.90, 0.90	0.28

RAC	Processed product	No.	PF	Mean/median PF
	Raisin	11	1.41, 1.47, 1.58, 1.69, 1.82, 1.86, 2.42, 3.0, 3.15, 3.68, 4.23	1.86
Strawberry	Jam	1	0.29	0.29
Tomato	Juice	2	0.30, 0.38	0.34
	Paste	2	4.12, 6.25	5.2
	Preserve	2	0.29, 0.30	0.30

Cherries (RAC residues 0.86, 1.0 mg/kg) were processed into juice and preserve with processing factors of 0.02 and 0.23. Based on the STMR value of 1.35 mg/kg for cherries, the STMR-Ps were 0.03 mg/kg for cherry juice and 0.31 mg/kg for preserves.

Plums (RAC residues < 0.05 mg/kg) were processed into sauce and dried prunes. No detectable residues were reported in sauce but 0.1 mg/kg in prunes. As the concentration of residues was at the LOQ in the RAC, no STMR-P values could be estimated.

Grapes were processed into juice, must, wine and dried fruit (raisins) with processing factors of 0.51, 0.415, 0.28 and 1.86 respectively. Based on the STMR value of 4.3 mg/kg for grapes, the STMR-P for juice was 2.2 mg/kg, for must 1.8 mg/kg, for wine 1.2 mg/kg and for raisins (dried grapes) 8.0 mg/kg. Based on the highest fenhexamid residue of 11 mg/kg, the Meeting estimated a maximum residue level of 25 mg/kg for residues in raisins (dried grapes).

Strawberries (RAC residues 0.66 mg/kg) were processed into jam with a processing factor of 0.29. Based on the STMR value of 3.3 mg/kg for strawberries, the STMR-P value was 0.96 mg/kg for residues in strawberry jam.

Tomatoes (RAC residues 0.34, 0.96 mg/kg) were processed into juice, paste and preserve with processing factors of 0.34, 5.2 and 0.3, respectively. Based on the STMR value of 0.395 mg/kg for tomato, the STMR-Ps were 0.13 mg/kg, 2.05 mg/kg and 0.12 mg/kg for residues in tomato juice, paste and preserves, respectively.

Lettuce head Two processing-type studies were performed with fenhexamid on head lettuce. The trials were designed to determine the extent of the residue deposits on the outer leaves as well as the effect of washing on residue levels. Processing was conducted using household practices. The residues measured in different plant parts indicate variations in the distribution of fenhexamid on the plant.

The residue levels of fenhexamid in lettuce head RACs sampled on day 3 after the last applications were 1.3–6.0 mg/kg. Values of 4.2–11.0 mg/kg were measured in the outer leaves, which demonstrate that the major portion of the residues was deposited on the surface, as is to be expected. The residue level in the inner head samples (heads without outer leaves) from these trials were 1.5–2.6 mg/kg, and those in the inner leaf samples ranged from 1.5–3.5 mg/kg. The residues in "inner leaves, washed" ranged from 0.35–0.99 mg/kg and from 0.27–0.91 mg/kg in the washing water.

The studies demonstrated that the residues of fenhexamid are concentrated on the outer leaves (factors 1.7, 3) and washing reduces the concentration of residues on leaves.

Residues in animal commodities

Fenhexamid treated raw agricultural commodities are not fed to farm animals. The only processed feedstuff might be almond hulls. The dietary burden of fenhexamid for beef and dairy cattle arising from almond hulls is very low: 0.12 mg/kg for the maximum and 0.06 mg/kg for the median animal dietary burden.

Table 57. Estimated maximum dietary burden of farm animals

Commodity	Codex Commodity Group	Residue (mg/kg)	Basis	% Dry matter	Residue, on dry wt (mg/kg)	Chosen diets, %			Residue contribution (mg/kg)		
						Beef cattle	Dairy cattle	Poultry	Beef cattle	Dairy cattle	Poultry
Almond hulls	AM	1.1	Highest residue	90	1.2	10	10	-	0.12	0.12	-

Table 58. Estimated median dietary burden of farm animals

Commodity	Codex Commodity Group	Residue (mg/kg)	Basis	% Dry matter	Residue, on dry wt (mg/kg)	Chosen diets, %			Residue contribution (mg/kg)		
						Beef cattle	Dairy cattle	Poultry	Beef cattle	Dairy cattle	Poultry
Almond hulls	AM	0.54	STMR	90	0.6	10	10	-	0.06	0.06	-

No feeding studies of fenhexamid on farm animals were received. The Meeting noted that in the metabolism study on a goat dosed for three days with the equivalent of 133 ppm fenhexamid in the feed the residues in all tissue samples were low and ranged from 0.007 mg/kg in muscle, 0.69 mg/kg in kidney, and 0.031 mg/kg in fat to 2.5 mg/kg in liver. No fenhexamid was detected in milk.

As this dosing level is more than 1100 times higher than the maximum estimated dietary burden of 0.12 ppm, the Meeting agreed that residues would not be expected in animal commodities and estimated STMRs and HRs of 0 for meat (from mammals other than marine mammals), edible offal (mammalian) and milks.

The Meeting estimated maximum residue levels of 0.01* (F) mg/kg for milks, 0.05*(fat) mg/kg for meat (from mammals other than marine mammals) and 0.05* mg/kg for edible offal (mammalian).

RECOMMENDATIONS

The Meeting estimated the maximum residue levels and STMR values shown below. The maximum residue levels are recommended for use as MRLs.

Definition of the residue (for compliance with MRLs and for estimation of dietary intake for plant and animal commodities): fenhexamid.

The residue is fat-soluble.

Table 59. Summary of recommendations.

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg
CCN	Name	New	Previous	
TN 0660	Almonds	0.02*		0.02
AM 0660	Almond hulls[1]	2		
FS 0240	Apricot	10		3.85
FB 0261	Bilberry	5		1.65
FB 0264	Blackberries	15		2.0
FB 0020	Blueberries	5		1.65
FS 0013	Cherries	7		1.35
	Cherry juice			0.03
	Cherry preserve			0.31
FB 0021	Currants, Black, Red, White	5		1.65

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg
CCN	Name	New	Previous	
VC 0424	Cucumber	1		0.185
FB 0266	Dewberries	15		2.0
DF 0269	Dried grapes (Currants, Raisins and Sultanas)	25		8.0
MO 0105	Edible offal (Mammalian)	0.05*		0
VO 0440	Egg plant	2		0.71
FB 0267	Elderberries	5		1.65
VC 0425	Gherkin	1		0.185
FB 0268	Gooseberries	5		1.65
FB 0269	Grapes	15		4.3
JF 0269	Grape juice			2.2
	Grape must			1.8
	Grape wine			1.2
FB 0270	Juneberries	5		1.65
FI 0341	Kiwifruit	15		6.3
VL 0482	Lettuce, Head	30		11.5
VL 0483	Lettuce, Leaf	30		11.5
FS 0247	Peach	10		3.85
VO 0051	Peppers	2		0.71
FS 0014	Plums (including Prunes)	1		0.31
MM 0095	Meat (from mammals other than marine mammals)	0.05* (fat)		0
ML 0106	Milks	0.01* F		0
FS 0245	Nectarine	10		3.85
FB 0272	Raspberries, Red, Black	15		2.0
FB 0275	Strawberry	10		3.3
	Strawberry jam			0.96
VC 4249	Squash, Summer	1		0.185
VO 0448	Tomato	2		0.395
JF 0448	Tomato juice			0.13
	Tomato paste			2.05
	Tomato puree			0.12

[1]Expressed on dry weight basis

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes of fenhexamid, based on the STMRs estimated for 30 commodities, for the five GEMS/Food regional diets were in the range of 0 to 6 % of the maximum ADI (Annex 3). The Meeting concluded that the long-term intake of residues of fenhexamid resulting from its uses that have been considered by JMPR is unlikely to present a public health concern. The results are shown in Annex 3 of the 2005 JMPR Report.

Short-term intake

The 2005 JMPR decided that an ARfD is unnecessary. The Meeting therefore concluded that the short-term intake of fenhexamid residues is unlikely to present a public health concern.

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